U. S. SCOUT CRUISERS CHESTER, BIRMINGHAM, AND SALEM.

THE PROCEEDINGS

OF THE

UNITED STATES NAVAL INSTITUTE.

Vol. XXXI, No. 1. MARCH, 1905. Whole No. 113.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PRIZE ESSAY, JANUARY 1, 1905.

AMERICAN NAVAL POLICY.

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Motto: "Be sure you're right; then go ahead."

NOTE.—[The writer found so much difficulty in coming to any conclusions about many points in naval policy, and discovered such different ideas among the men to whom he talked, that finally, for his own instruction, he adopted the plan of beginning with principles that every one admits, and arguing directly from them; striving all the time to keep an open mind, and allow no previously formed opinions to stand in the way of coming to unbiased conclusions. The most important conclusions he came to were that—

(1) The ships of our battle fleet have not been correctly designed from a military standpoint.

(2) The art and the science of naval tactics are undeveloped.

(3) The administration of the navy has not, until lately, given sufficient weight to military considerations.

These conclusions were so unexpected, that the course of reasoning which caused them is here submitted, with the request that it be examined carefully. The small space available in this paper, compared with the vastness of the subject, is the reason why much of the reasoning is merely outlined, not elaborated.]

GENERAL PRINCIPLES.

The Need for Armies and Navies.—Every individual and every community needs protection for its life and property; every gov-

ernment also needs protection for its life and property. As a government cannot get protection from another government without becoming dependent, it must furnish its own protection. It usually does this by means of an army and a navy. Perhaps the necessity for this protection is a misfortune: certainly it is a fact.

Armies and navies have existed since the earliest times. It might have been expected that the gradual progress of civilization would be followed by the gradual abolition of armies and navies; but such has not been the case. Civilization and armies and navies seem to have gone hand in hand; and while most of the triumphs of civilization have appeared to be solely the triumphs of peace, each has been made possible by the stable condition of society that was made stable by the triumph of some war. Armies came into effective use before navies; because the mechanisms used by armies are simpler than the mechanism used by navies, and were invented first.

Rising Importance of Navies.—For centuries the principal protector of a country has been its army. But the advance of the engineering arts during recent years, has made navies more available for protecting their countries than they were before, while making more nearly equal the conditions of warfare between the armies of weak and of strong nations, and less nearly equal the conditions of warfare between their navies. In the days not long gone by, the musket of the European was so much more powerful than the weapons of—say the savage—and the methods of discipline were so much better, that the armies of savage nations fought with Europeans on very unequal terms. But the spreading of trade has taken arms and munitions of war to the most distant parts; even the savage has come to have weapons as good as can be made; European officers of experience and skill have taught even savages to organize and maneuver according to the methods most approved in Europe; and armies have resulted which, while they are of savages, are highly trained, equipped and armed; with physique and courage at least equal to that of the European, and with the natural animal instinct of fighting less dulled by generations of activities of the peaceful kinds. But with naval warfare, the comparison of progress must be reversed; the canoe of the savage remains unchanged, but the battleship represents better than any other thing the progress of the ages. The savage, or the semi-civilized, are mentally and financially

unable to build, or man, or fight navies of the modern kind; and every day lengthens the distance between the sea-fighters of countries that differ in civilization and in wealth. Warfare on the sea is more closely connected with the progress of the world than is the warfare on the land. This fact explains the other well-known fact, that the navies of countries differ as their countries differ; that *national greatness and naval greatness co-exist.*

General Consideration Governing Naval Policy.—In considering what any naval policy should be, the truth must be held in mind that a navy must be fitted to cope with the navies of different kinds of people; and in considering what the naval policy of a country so great as ours should be, the truth must be held in mind that most of the countries with which our navy will have to deal have navies so weak that very small vessels will be enough to meet them; but that there are a few countries which have navies so powerful that the greatest navy we can get and the greatest exertion we can make, may not enable us to fight them with success.

Countries that have weak navies are much more numerous than countries that have strong navies; and the difference between weak navies and strong navies is well defined; so well defined that navies may be divided into two classes, weak and strong. Therefore, we may truly say that the work of our navy is of two kinds: first, that related to weak navies; second, that related to strong navies. And this difference is not academic, it is practical; and it is so important that it separates our naval policy into two parts, which it can be shown are wholly distinct, though they are often confused together.

In the days not long gone by, the smallest and cheapest vessel that was big enough to go to sea was not far different from the largest and costliest. Vessels at that time could not be built very large because the engineering arts had not advanced far enough to build them; and they could not be very small because they had to keep the sea; and the result was that vessels just big enough to guard a country's interests in a semi-civilized foreign port, were big enough to engage in battle with most of the war ships of a powerful State. But what comparison can there be to-day between the ill-armed and ill-equipped, little vessels of a West India Republic and the awful battle-fleet of a European power; and what comparison ought we to observe between the vessels of our navy that we use to meet them? Shall we use the same kind of

vessel for meeting both? Shall one general policy govern conditions so diverse?

Purpose of a Navy.—To answer this question wisely, it may be well first to reflect a few minutes on what is the purpose of a navy. To do this sufficiently for our purpose, it is not necessary to be in the least profound or learned, but simply to use the common sense we use in daily life. It is a common belief that the purpose of a navy is to protect trade; that the foundations of a nation's greatness are built on trade; that a navy is to guard these foundations; that navies are the police force of the sea. It is also held by some that the purpose of a navy is to form the "First Line of Defence," and there are some who hold that its purpose is to secure "Command of the Sea," in order that our soldiers may go and attack some other country; or else that the soldiers of some other country may be prevented from coming to attack us.

It is plain that the purpose of a navy includes all of these things; but it is conceivable that a country might have very little foreign trade; might have so strong a people that invasion by a foe would be impossible; might never care to invade another country with soldiers and yet might need a very powerful navy. Our own country is so rich inside of its own borders, that it does not absolutely *need* any sea-borne trade, either foreign or coastwise; it is so strong in men, that no foe successfully could invade it; it sees, at present, no sign of ever wishing to invade a foreign land; and yet it has asserted and must maintain a doctrine, the violation of which will demand a resistance so violent that it will call for every resource within our grasp, and entail a struggle that will end only with the prostration of the beaten country. Japan was in this position. She did not call her doctrine the "Monroe Doctrine"; but she declared that the freedom of Manchuria and Korea from Russian domination were essential. Her war with Russia was fought to save her life, not to protect her trade.

The idea that a navy exists solely to protect trade seems to spring largely from the writings of British men, for to Great Britain, trade is the mainspring of existence. Her merchants have pushed their ventures to the uttermost parts of the earth, and have enriched the mother country with the receipts of the spoils of their peaceful conquests, and the opportunities for sale, in distant lands, of her manufactured goods. With a navy not strong enough to protect her subjects in foreign lands, to guard her trad-

ing stations and bases, to assure her merchant vessels safe transit on the sea, to keep away a blockading fleet that would prevent the going out and coming in of the commerce of the world, the people of Great Britain would surely starve. With us it is different, we are self-supporting within our borders; we *can* live alone; we do not need a navy to keep us from starving. But the fact that a country may not need a navy for precisely the same reason that Great Britain needs one, is not a cause for believing that she may not need one just as urgently for some other reason. The trade conditions of little Great Britain make it a vital point in her policy that she shall have a great navy; but the nearness of the Russians to Korea made it a vital point in the policy of Japan that she should have a great navy. And the fertile parts of the West Indies and Central and South America hold out a temptation to the crowded monarchies of Central Europe not unlike that which the long coast-line of Korea held out to coast-hungry Russia; so that it is not impossible that a war will come between us and some European power, or powers, the cause of which will be like that which brought on the war between Russia and Japan.

To state that the United States can exist without any sea-borne trade, however, is not the same thing as to state that it can live prosperously without it, or that the expenditure of a reasonable sum of money on a navy for assuring it may not be very wise. The statement "'Tis love that makes the world go round" has been contradicted by those who assert "'Tis trade that makes the world go round;" but without weighing the relative importance of love and trade, it may be asserted that each is important, and each should be assured. Every nation, like every individual, needs intercourse with others and is dependent for wealth on trade with them; and the more wise the policy under which the trade is carried on, the greater the trade becomes and the more money flows into the pockets of the people. Great Britain is an example of this, and China of the reverse.

The greater the trade becomes, the greater the number of traders who will be concerned, the greater the number of transactions, the larger the sums of money involved, the greater the trade rivalries, the greater the number and importance of the chances of conflict, and the greater the need of a navy, to guard the traders and the trade; because, no matter what cause brings on a war, ocean trade is always attacked at once. And while it

might be difficult to catch swift merchant ships after they once had got far out to sea, it would be very easy for the country having the stronger navy to make the exit of ships from its enemy's ports so doubtful of success that insurance rates would rise so high, that the business risk in exporting goods would become too great to permit the merchants to compete in foreign markets with the merchants of other countries, both neutral and belligerent. Ships coming to the country, also, bringing imports and the money due for manufactured exports, would be liable to capture. Not only then would the export trade be cut down, but the import trade as well, and the receipts from the diminished export sales. The coast-wise trade would practically be killed.

The evils with which such a state of affairs would begin would increase as time went on. The merchants of the country with the weaker navy would gradually lose touch with their correspondents abroad, which they might never be able to regain. The thousands of people whose wages depend on manufactured exports would feel the loss at once and always, and so would the people with whom they dealt in business. The fact of such a blockade (partial though it would be, and carrying with it no menace whatever of invasion) would mean loss in money, direct or indirect, to every person in the country; and to this would afterwards be added a sum of money that would be exacted by the victor to pay him for his expenses in the war and for the trouble he had been taking. An estimate of how much would be exacted from the United States, for instance, may be gathered from the fact that Germany made France give her $1,000,000,000 and the provinces of Alsace and Lorraine for coming to terms of peace in 1871. This country is very much richer than France then was, and would be mulcted in proportion.

This sketch, rough and brief though it is, is probably sufficient to show us that, while the purpose of a navy includes the protection of her country's trade, it may be broadly stated that its purpose is to enforce the will of its government; to enable it to carry out whatever its policy may be.

Duty of Our Navy.—Obviously the duty of our navy is:

(1) To protect our trade and our citizens everywhere.

(2) To be prepared for war.

(1) This duty we can do very easily. We have been doing it for a hundred years; and as we have grown to be very much more

powerful than most of the countries in which our citizens are liable to get unfair treatment, we need feel no anxiety on this score. We have many vessels powerful enough to exert all the force needed. In fact the vessels that we now have doing this kind of duty all over the world, are more powerful than those thus used by most other countries, even countries having navies more powerful than our own. The causes of trouble that usually arise are with people who can show only a small hostile force, so that cruisers are perfectly adequate for the purpose. Sometimes landing forces are needed; and for this purpose our large transports, carrying battalions of marines, landed under cover of cruisers' guns are almost ideal in their effectiveness. We do not need battleships or armored cruisers for this work; except, possibly, in emergencies of very rare occurrences.

(2) This duty we cannot do very easily. Getting ready for war is perhaps the hardest work that man can do. In actual war there is an element of excitement that arouses, even compels, exertion of the most strenuous kind. But the long years of peace, with their endless drills that seem to have no purpose, furnish little stimulus of excitement, or sometimes even interest. Yet no country ever whipped in any important war, without being well prepared; and in almost every war of history, the difference between the contending forces has been greater in preparedness than in any other thing. In mere bravery, there has been less difference than in any other thing, because nearly every one has been brave. A mere glance at the enormous armaments of our possible antagonists, and even a hurried reading about the way they have been drilling for thirty years, are enough to show us that we need to do a tremendous amount of work, to get even nearly ready for war; and inasmuch as the duty of simply protecting our trade and our citizens over the world is easy and we have learned to do it well, we must not allow it to interfere in the slightest with our urgent preparation for war. We must keep our preparation for war as a definite purpose before our eyes all the time; we must make it a specialty.

Proper Strength of Our Navy.—But while preparing for war, it may be well to ask ourselves, "Have we a navy strong enough to go to war?"

In order to answer this question wisely, it may be well first to consider when is a navy—or any military force—"strong

enough?" It may seem, at first thought, like a mere juggling with words to say that a force is strong enough when it can do the work cut out for it to do; but this expression points to the fact that we must first decide what work our navy will have to do. For instance, will our navy simply resist the acts of some aggressor, or will it become itself an aggressor? It is plain that if our navy is to be aggressor, it must be stronger than the enemy, so that it can break down his opposition and have something left afterwards. It might seem that if it were to offer a purely passive resistance, it would be strong enough if it were simply equal to the force of the aggressor; which would indicate that passive resistance is better than aggressive resistance. But everyone knows that this is not so. Perhaps it would be if the passive force could tell exactly where and when the aggressor was going to strike; but this is what it can never do. Constant aggression is sure to wear away in time any purely passive resistance, just as in natural science, any force continuously exerted will have an effect; just as "continual dropping of water will wear away a stone." Any resistance is worn away in time, unless it is active. It must be such as to inflict injury on the aggressor, and to follow it up; it must have initiative; it must partake of the nature of a menace. We see that this principle of meeting aggression with aggression, instead of with passive defense, is recognized by all the brute creation. Not one of the brute creation, unless hopelessly overpowered or frightened, will retreat into a corner. He will at once actively attack his aggressor, and make him look to his own safety. Now, inasmuch as our enemy, whoever he may be, will follow this principle, and we will do the same, it follows that our navy will have to fight with all the power and aggression it can muster, an enemy who will do the same. Such a war will be forced to a finish—and a very definite one. It will be shown later that a very slight advantage at the start on either side will, by an accumulating effect, become greater as the fight goes on. Therefore, in order to whip, in order to be strong enough to go to war, *our navy must be stronger at the start than the navy of the enemy.*

We may accept it as a principle then that our navy will be "strong enough" when it is stronger than the enemy, and not before.

The Folly of Ineffectual Resistance.—A curious and most important phase of this principle is that if a navy be not strong

enough, it were better not to use it at all, but to yield to the aggression in the beginning. The evident reason is that if we use an inferior force and get whipped, we not only lose the cause for which we fought, but we also lose more of our fighting force than the enemy does of his, and so we are worse placed relatively to the enemy than we were before. An ineffectual resistance is worse than none; and the longer the resistance is kept up, the worse it is for the weaker party. The evil is cumulative. The effect of our using our navy to repel the aggression of a power or powers having a stronger naval force would, therefore, be simply that those powers would succeed in violating the Monroe Doctrine, would reduce our navy to nothing with comparatively small damage to themselves, and then use the naval force they had left to shut our people within their borders, and make them pay whatever war indemnity they—the foreigners—happened to desire.

Proper Comparative Sizes of American and British Navies.—With these facts in mind, it is interesting to consider the statement often made that Great Britain needs a greater navy than we do, for the reason that Great Britain's life depends on her foreign trade, and ours does not. For without attempting to gainsay the truth of the statement, it is merely necessary to point out that the chance of Great Britain's getting into war with a great power is much smaller than ours, because Great Britain has gone through the turbulent period of her youth, and has reached the tranquil years of middle life, whereas we are at the very verge of budding manhood. Great Britain made her way to her present high estate through terrific wars on land and sea. Every other great nation in history has done the same. Shall not we? If not, why not? Will it be because we are not aggressive? Will it be because we are too poor to tempt the plunderer? Will it be because our system of government is the kind the monarchies of Europe like? Will it be because the American people are afraid of war? Will it be because there are no jealousies felt toward us on this continent, or other continents? Will it be because of any definite reason that can be given? No, there is not a single reason to give, or to imagine, why the American people should not go through the same series of wars that all other nations have gone through. It is logical to assume that any man will pass through the same experiences, in the main, as other men; and

the same is true of nations. It may be pleasant to imagine that Providence makes special exceptions in favor of us, but it is very foolish. Bearing this in mind, what definite reason can be given why Great Britain, a country no greater than ours, should need a navy greater than ours? Our chance of getting into war is greater; and while being whipped would not injure us quite so much in a material way, it would cost us, even in a material way, so much that the cost of a very great navy would be trivial in comparison. On the basis that a navy exists to protect property on the sea, perhaps Great Britain needs a greater navy than we, because she has more property on the sea than we; but on the basis that a navy exists to enforce the policy which is necessary to a country's preservation as a nation, and on the basis that "Government of the people, for the people, and by the people must not perish from the earth," we need a navy even larger than Great Britain's; because our policy is more provocative of war than hers, especially with monarchies.

What Antagonists Our Ships will Probably Fight.—But whatever the size of the navy, the quality of it, the kinds of ships and fleets, is especially the concern of naval officers. Before coming up to this question, it may be interesting to think about what antagonists the ships will be wanted to fight.

Leaving out the ships used for visiting the ports of countries with weak navies, it is clear at the start that our ships will have to fight forts, merchant ships and war ships. Shall we design them for all these uses, or for one in particular; and, if for one, for which one? A very short consideration of the problem of designing a war ship to fight a modern fort, convinces us of the utter impossibility of succeeding; because a fort can be given as much offensive power as a ship, is not liable to "unforeseen submersion," and is not limited as to the number of submarine mines, submarine boats and torpedoes that she may use, to make her impregnability assured. The progress of the engineering arts has helped forts even more than it has helped ships; and the superior accuracy of gun-fire attainable by a fort caps the climax to an advantage already overpowering. At the outset we see that in the present state of the art, ships cannot fight modern forts successively. The best that ships can do regarding forts is to run by them; but every improvement in torpedoes, submarines, and fire-control makes even this more difficult.

In considering whether the ships of our battle-fleet should be constructed so as to fight merchant ships, we come face to face with the fact, that, in order to fight merchant ships, war ships must be very fast; and this means that they must carry so much weight in motive power that they will not be able to carry so much weight in guns and armor as they would otherwise; so that they will not be able to fight certain war ships that they could fight otherwise. It has been held by some that the best way in which to use a navy is to destroy the enemy's commerce, for the reason that this is the way in which a country can be the most harmed. Without discussing this question, it may be pointed out that, even if it be true, the best way to destroy an enemy's commerce may not be to attack the commerce directly by "commerce destroyers," which would have to play a game of "blindman's buff" all over the ocean. It may be that her commerce can be more effectively attacked by other means. An illustration of this idea may be drawn from the game of chess, in which, although the ultimate end of the game is to checkmate the king of your adversary, it may be (and usually is) the most unskillful plan to start the game by "checking" him. It is best to break through and break down the protection thrown about the king, until the king is exposed. And so, even if the destruction of an enemy's commerce be the ultimate end to be attained, it is considered best *first* to break down the military defense to his commerce which his navy gives.

No matter, then, what kind of forts and merchant ships the enemy may have, our war ships will be used mainly to fight war ships.

What Kind of Battle-Fleet Do We Need?—Now if this conclusion be correct, and if we assume that our enemy will have come to this conclusion as well as ourselves, it is plain that when we come to war with any great naval power or powers, we shall have to fight a fleet or fleets of tremendous strength; and that this necessity will bring us face to face with a more frightful danger than the country has known since its birth in the revolution of '76. We see plainly, therefore, what we have to get ready to do. We see the reality in all its harshness. What shall we do to be saved? What is the best way in which to meet force with force?

These questions evidently mean "what kind of battle-fleet do we need?"

THE BATTLE-FLEET.

In order to decide what kind of battle-fleet we need, it is plain that we must look at the subject from what is usually called a "military standpoint"; a standpoint from which we can regard the conditions the fleet must be able to meet, in order to prevail in war. To do this, we must first consider what work the battle-fleet will have to do.

What Work Will It Have to Do?—We shall not have to think about this very long before seeing that the work our battle-fleet will have to do in war will be of two kinds; first, that done near the shore; and second, that done on the open sea. That part done near the shore may also be divided into two parts, that part which we should do in defending our own coast, and that which we should do in carrying on operations against an enemy's coast.

The work which we should do in our own coast would clearly be of the nature of defense against an attacking fleet or landing force. In this we would probably co-operate with the army; and our own work would be mainly done by coast-defense vessels, such as monitors, destroyers, torpedo-boats, submarines and cruisers.

The work which we would do in carrying on operations against an enemy's coast would probably be, as it has recently been with Japan, in assisting the landing of large bodies of soldiers and marines. The kinds of vessels that we would use for this would be very much like those used in defending our own coast, except that we should probably not use monitors, and that we should use large numbers of transports.

It is true that, in both the defense of our own coast and the attack of an enemy's coast, our battleships might be drawn near the coast; but an enemy can so easily make the coast dangerous by means of torpedo-boats, submarines and mines, that battleships must, as a rule, keep away from it. An important exception to this is the case in which submarines and mines are not much to be feared, and a great many destroyers are available to keep off the enemy's torpedo-boats.

Operations near the coast, will probably be carried on, for the most part, by small ships. Submarines, perhaps, will be used more in the future than seemed probable a year ago; and it is possible that the submarine may gradually do away with the torpedo-boat, or cause it to be greatly modified, for the reason that

it can do nearly everything that a torpedo-boat can do and more besides; and while its speed is not so great in smooth water as that of the torpedo-boat, its speed can be increased by increasing its length.

The work done on the open sea would, of course, have to be done by the battle-fleet, and would simply be that of fighting the enemy's battle-fleet.

Now, as it would clearly be impossible for any fleet of small vessels to carry on important operations near a coast very long if the enemy's battle-fleet could at any time attack it, unless it had its own battle-fleet to protect it, we see that, both for work near the coast, and for work on the open sea, the thing that we must rely on in the end is our battle-fleet; the deciding event will be a fight at sea between our battle-fleet and the enemy's battle-fleet.

It is true that a war, even a war in which our navy did important work, might go from start to finish, and yet contain no such battle, but this could only be in case the enemy should fail to concentrate his fleet, as Russia has in the present war. It could not happen with the kind of navy that we must prepare to meet; a strong navy.

Qualities of the Ships of the Battle-Fleet.—The main question before us, then, is what kind of a fleet shall we need with which to fight the battle-fleet of a strong navy; what should be the qualities of the ships comprising it?

Before attempting to decide this, it may be well to picture to ourselves two hostile fleets meeting on the sea in war, each fleet representing everything which its nation can put forth.

Now, when two armies come within each other's presence, before the actual battle begins, there is a great deal of maneuvering for position. Will the same thing happen when two great fleets meet? It may be objected that there can be no such thing as "position" on the sea, because all parts of the sea are the same; without mountains, or woods, or roads, or any of the other things which give tactical positions in battles on the land. But in the days not long gone by, in the days when the great naval battles of history were fought, the weather-gage, or the lee-gage, as the case might be, was a thing strenuously maneuvered for. At the present day, though ships move on the water independently of wind and sea, yet wind and sea exercise an influence which is very important on the gunnery, and so does the direction of the sun;

and when everything in the world, so far as the two fleets are concerned, depends on the issue of that battle, the direction of the wind, and sea, and sun, will be taken into anxious account by both the admirals. There can be no doubt, for instance, that the fleet that is to windward, if it can at the same time have the sun on the side away from the enemy, will have a great advantage in gunnery over the fleet to leeward, with the sun in the eyes of its gun-pointers. The importance of this matter will depend a great deal on the strength of the wind and sea, and the altitude and brightness of the sun. But if the sun be very bright, and if the wind and sea be high, and throwing spray over the telescope sights, and blowing smoke back on the guns' crews, the leeward fleet will certainly be at a tremendous disadvantage; especially if its guns be low, like those in our navy. If the direction of the wind and the sea and the sun are not the same, the question what will be the best position will become a little complicated; but, in every case, there will be some position that will be the best, and both admirals will know which it is, and try to get it.

This simply means that the battle will begin with a race between the two fleets, and that that fleet will get the advantage of position which is the faster. We may take it as a principle, then, that the first quality in our fleet to be demanded in a fleet fight will be *speed*.

Speed.—But it is not only in the struggle for position in the beginning, that our fleet will need a speed greater than the enemy's, but all during the fight; largely because the fleet having the greater speed can keep a little ahead, near the outer limit of torpedo range, and use its torpedoes effectively, while the fleet with slower speed cannot reach the faster fleet with its torpedoes, unless its torpedoes possess greater range. Besides, if the two fleets run along in parallel columns, which is the usual way in an important fleet fight (because more guns can be used then) the faster fleet can get so far ahead of the slower fleet that it can concentrate its fire on the head of the column of the slower fleet, with a good chance of disabling the leading ships, and throwing the column into confusion; while the rear ships of the slower fleet cannot fire at the faster fleet, except at great range. The average range of the guns of the faster fleet will be less than the average range of the guns of the slower fleet, and its head of column practically safe. The faster fleet may even be able to get across

the head of the column of the slower fleet and *T* it; which is the same thing as flanking in fighting on the land. It is true that the slower fleet may be able to offset the disadvantage in speed, to some extent, by going around in a circle of somewhat shorter radius than the circle which the faster fleet would take up to keep parallel with it, if there be plenty of sea-room on that side; but this will not always be the case.

But the greatest advantage of superior speed is that the faster fleet can increase and decrease the range at pleasure; and even withdraw from, or go into, battle, whenever it thinks best. This puts the slower fleet on the defensive; it has to do exactly what the faster fleet wants it to do, in the matter of how to fight, and even fighting or not fighting. It has to conduct the battle on the terms preferred by the faster fleet. This is true, even on the open sea, but superior speed has a heightened value when the operations take place near land; because the existence of shoals, capes, harbors of refuge, and even of the land itself, which forbids movements in some directions, makes certain position near them of strategic and tactical importance.

It is in attaining positions of strategic and tactical importance, that speed has its crowning value.

We see, therefore, that, if we are to make our fleet successful in war, we must make it faster than our enemy's fleet; and it is the *fleet as a unit*, that we must make fast; for capacity for a speed in any individual ships that is higher than the fleet-speed will clearly be wasted. And this high fleet-speed is to be held on the open sea, where the water is often very rough.

Now there is only one way in which to get high speed in a rough sea, and that is to use engines of very great power, and put them in a ship that has great length, and depth, and mass; the length and depth are needed, in order to decrease the resistance of the water; and the mass is needed to give the ship enough momentum, to maintain her speed, in spite of the hammering of the waves.

We may accept it as a principle, therefore, that the ships of our battle-fleet must be very long and deep and massive.

Manageability.—But "the race is not always to the swift;" and it may be that some other quality will enter into the question of getting the best position. We know that this is the case when yachts are jockeying for position at the beginning of a race. That

yacht will get the advantage of position which is capable of being the best handled, and which is the best handled. We are not thinking now about the degree of skill of the admirals; and we see that if we consider these equal, for the moment, that fleet which can be handled the best, will probably get the advantage of position. In other words, we see that the *manageability* of the fleet may be the deciding factor, when the two fleets are jockeying for position. The two things which seem to be the most closely connected with the manageability of a fleet are the signalling, and the quickness and uniformity with which the ships turn together.

A very few moments' thought will show us, that other things being equal (which we must always consider to be the case, when comparing any two independent things), that fleet will have a great advantage whose signalling is the quickest and the most accurate. If our signalling is slow and uncertain, our fleet will be at a great disadvantage with the other fleet, if its signalling is quick and sure. In the jockeying for position at the beginning of the battle, or in carrying on the numberless changes that circumstances make necessary, the value of quick and sure signalling may be so great as to decide which fleet will win.

The way in which the ships turn together in making changes of formation and direction, is of importance principally from the fact that, during the interval in which any change of formation or direction is being made, the gun-fire must be carried on at an enormous disadvantage; and in some cases, it must cease altogether, until the evolution is completed. Now if the ships can turn quickly as individuals, and are nearly alike, they can be swung from column into line, and thence into echelon, so quickly and precisely that they can be lined up in the new formation at once; and the fleet will have a tremendous advantage over a fleet whose vessels are unlike, because, even if the unlike ships turn quickly as individuals, and even if the officers controlling them use great skill and care, the ships cannot be gotten into proper positions after each evolution, until after a considerable time spent in aligning and adjusting. The difference between two fleets in this regard, even if the average power of the ships be the same, will be the same as always lies between order and disorder. Perhaps an apology is due for dwelling so long on a self-evident truth; but the fact that a truth is self-evident, is not always a reason against reiterating it, because the most self-evident truths

are often those most often overlooked. The importance of being able to swing our ships into various formations with quickness and precision is greater than that of being able to go "fours right" in company drill with quickness and precision, and yet most of us have seen a thousand times as much time spent in exercising men in company drill as in exercising ships in fleet drill. And while the laws of nature prevent our having any great variety in the kind of men that we have in our companies of infantry, the rapid progress in all the engineering arts causes such rapid improvements in ship construction, that it is difficult to limit the varieties of ships that we have in our fleet.

Clearly, we may accept it as a principle, that the second quality in a fleet to be demanded in battle will be *manageability*.

Offensive Power.—After our two fleets have, after more or less maneuvering, got within effective gun-range of each other, the gunnery fight will begin between them; and it will continue until the battle is decided in favor of one contestant, or until one is able to escape. Supposing the two fleets to be officered and manned by men of equal skill, it is a mere juggling of words to say that the stronger force will win; supposing that neither side has been able to obtain any decided advantage of position.

In an endeavor to get a clear idea of what will happen, the following tables have been brought into being. They do not treat the subject with mathematical rigor, and are, at the best, approximations; but leave is requested to submit them as such.

These tables grew out of an attempt to ascertain how the values of two contending forces change as the fight goes on. The offensive power of the stronger force is placed in the beginning at 1000 in each case, and the offensive power of the weaker force at 900, 800, 700, 600, 500, 400, 300, 200, and 100. These values are, of course, wholly arbitrary, and some may say imaginary; but, as they are intended merely to show the comparative strength of the two forces, they are a logical measure, because numerical; there is always some numerical factor that expresses the comparative value of two contending forces, even though we never know what that numerical factor is. Two forces with offensive powers of 1000 and 900 respectively may mean 1000 men opposed to 900 men of equal average individual fighting value, commanded by officers of equal fighting ability; or it may mean 10 ships opposed to 9 like ships, manned by officers and men of equal num-

bers and ability; or it may mean two forces of equal strength, as regards number of men, ships and guns, but commanded by officers whose relative ability is as 1000 to 900. It may be objected here that it is ridiculous so to compare officers, because the ability of officers cannot be so mathematically tabulated. This, of course, is true; but the fact that we are unable so to compare officers is no reason for supposing that the abilities of officers, especially officers of high position, do not affect quantitatively the fighting value of the forces they command; and the intention in mentioning this factor is simply to show that the relative values of the forces, as indicated in these tables, are supposed to include all the factors that go to make them up.

Another convention, made in these tables, is that every fighting force is able to inflict a damage in a given time that is proportional to the force itself; that a force of 1000, for instance, can do twice as much damage in a given time as a force of 500 can; also that a force can do an amount of damage under given conditions that is proportional to the time in which it is at work; that it can do twice as much damage in two hours, for instance, as in one hour, *provided the conditions for doing damage remain the same.* Another convention follows from these two conventions, and it is that there is a period of time in which a given force can destroy a force equal, say to one-tenth of itself under certain conditions; that there is some period of time, for instance, in which, under given conditions, 1000 men can disable 100 men, or ten ships disable one ship, or ten guns silence one gun. In the conflicts supposed to be indicated in these tables, this period is the one used. It will be plain that it is not necessary to know how long this period is, and also that it depends upon the conditions of the fight.

In Table I, it is supposed that the chance of hitting and the penetrability are the same to each contestant. In other words, it is assumed that the *effective targets* presented by the two forces are alike in the sense that, if the two targets are hit at the same instant by like projectile, equal injuries will be done. In other words, if each contestant at a given instant fires, say a twelve-inch shell, the injury done to one will be the same as that done to the other; not proportionally but quantitatively. For instance, if one force has ten ships and the other has nine like ships, all the ships being so far apart that a shot aimed at one ship will prob-

TABLE I.

		Column 1.	Column 2.	Column 3.	Column 4.	Column 5.	Column 6.	Column 7.	Column 8.	Column 9.	Column 10.
Value of offensive power at beginning..	A	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	B	1000	900	800	700	600	500	400	300	200	100
Damage done in 1st period by.....	A	100	100	100	100	100	100	100	100	100	100
	B	100	90	80	70	60	50	40	30	20	10
Value of offensive power at end 1st period.....	A	900	910	920	930	940	950	960	970	980	990
	B	900	800	700	600	500	400	300	200	100	0
Damage done in 2d period by.....	A	90	91	92	93	94	95	96	97	98	..
	B	90	80	70	60	50	40	30	20	10	..
Value of offensive power at end 2d period.....	A	810	830	850	870	890	910	930	950	970	..
	B	810	709	608	507	406	306	204	103	2	..
Damage done in 3d period by.....	A	81	83	85	87	89	91	93	95	..	..
	B	81	71	61	51	41	31	20	10	..	..
Value of offense power at end 3d period.....	A	729	759	789	819	849	879	910	940	..	..
	B	729	626	523	420	317	214	111	8	..	..
Damage done in 4th period by.....	A	73	76	79	82	85	88	91	..	..	..
	B	73	63	52	42	32	21	11	..	..	..
Value of offensive power at end 4th period.....	A	656	696	737	777	817	858	899	..	..	..
	B	656	550	444	338	232	126	20	..	..	..
Damage done in 5th period by.....	A	65	70	74	78	82	86	..	..	..	..
	B	65	55	44	34	23	13	..	..	..	..
Value of offensive power at end 5th period.....	A	591	641	693	743	794	845	..	..	..	..
	B	591	480	370	260	150	40	..	..	..	..
Damage done in 6th period by.....	A	59	64	69	74	79	85	..	..	..	..
	B	59	48	37	26	15	4	..	..	..	..
Value of offensive power at end 6th period.....	A	532	593	656	717	779	841	..	..	..	..
	B	532	416	301	186	71	0	..	..	..	..
Damage done in 7th period by	A	53	59	66	72	78	..	..	..	..	..
	B	53	42	30	19	7	..	..	..	..	..
Value of offensive power at end 7th period.....	A	479	551	628	698	772	..	..	..	..	..
	B	479	357	235	114	0	..	..	..	..	..
Damage done in 8th period by.....	A	48	55	63	70	..	..	..	..	..	..
	B	48	36	24	11	..	..	..	..	..	..
Value of offensive power at end 8th period	A	431	515	602	687	..	..	..	..	..	..
	B	431	302	172	44	..	..	..	..	..	..
Damage done in 9th period by.....	A	43	52	60	69	..	..	..	..	..	..
	B	43	30	17	4	..	..	..	..	..	..
Value of offensive power at end 9th period.....	A	388	485	585	683	..	..	..	..	..	..
	B	388	250	119	0	..	..	..	..	..	..
Damage done in 10th period by.....	A	39	49	59	..	..	..	..	..	..	..
	B	39	26	11	..	..	..	..	..	..	..
Value of offensive power at end 10th period.....	A	349	466	574	..	..	..	..	..	..	..
	B	349	201	53	..	..	..	..	..	..	..
Damage done in 11th period by.....	A	35	46	57	..	..	..	..	..	..	..
	B	35	20	5	..	..	..	..	..	..	..
Value of offensive power at end 11th period.....	A	314	440	569	..	..	..	..	..	..	..
	B	314	155	0	..	..	..	..	..	..	..
Damage done in 12th period by..	A	31	44	..	..	..	..	..	..	..	..
	B	31	16	..	..	..	..	..	..	..	..
Value of offensive power at end 12th period.....	A	283	426	..	..	..	..	..	..	..	..
	B	283	111 etc.	..	..	..	..	..	..	..	..
Total damage done by	A	717	789	800	700	600	500	400	300	200	100
	B	717	574	431	317	228	159	..	..	..	..

TABLE II.

		Column 1.	Column 2.	Column 3.	Column 4.	Column 5.	Column 6.	Column 7.	Column 8.	Column 9.	Column 10.
Value of offensive power at beginning..	A	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	B	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Damage done in 1st period by.....	A	100	100	100	100	100	100	100	100	100	100
	B	100	90	80	70	60	50	40	30	20	10
Value of offensive power at end 1st period.....	A	900	910	920	930	940	950	960	970	980	990
	B	900	900	900	900	900	900	900	900	900	900
Damage done in 2d period by.....	A	90	91	92	93	94	95	96	97	98	99
	B	90	81	72	63	54	45	36	27	18	9
Value of offensive power at end 2d period.....	A	810	819	828	837	846	855	864	873	882	891
	B	810	809	808	807	806	805	804	803	802	801
Damage done in 3d period by.....	A	81	82	83	84	85	86	87	88	89	90
	B	81	73	65	57	48	40	32	24	16	8
Value of offensive power at end 3d period.....	A	729	737	745	753	761	769	777	785	793	801
	B	729	736	743	750	758	765	772	779	786	793
Damage done in 4th period by.....	A	73	74	75	76	77	78	79	80	81	82
	B	73	66	57	50	43	36	28	21	14	7
Value of offensive power at end 4th period.....	A	656	663	670	677	684	691	698	705	712	719
	B	656	650	645	639	633	627	623	617	611	605
Damage done in 5th period by.....	A	66	66	67	68	69	70	71	72	73	74
	B	66	59	52	45	38	31	25	19	12	6
Value of offensive power at end 5th period.....	A	590	597	603	609	615	621	627	633	639	645
	B	590	581	572	563	553	544	537	527	518	509
Damage done in 6th period by.....	A	59	60	60	61	62	63	64	65	66	67
	B	59	53	46	39	33	27	21	16	10	5
Value of offensive power at end 6th period.....	A	531	537	543	548	553	558	563	568	573	578
	B	531	518	505	491	477	464	453	439	428	413
Damage done in 7th period by.....	A	53	53	53	54	55	55	56	56	57	57
	B	53	47	41	34	29	23	18	13	9	4
Value of offensive power at end 7th period.....	A	478	484	490	494	498	503	507	512	516	521
	B	478	490	442	423	405	387	371	353	338	317
Damage done in 8th period by.....	A	48	48	49	49	50	50	51	51	52	52
	B	48	41	35	29	24	19	15	11	7	3
Value of offensive power at end 8th period.....	A	430	436	441	445	448	453	456	461	464	469
	B	430	407	386	359	335	312	291	268	245	222
Damage done in 9th period by.....	A	43	43	44	44	45	45	46	46	47	47
	B	43	37	30	25	20	16	12	8	5	2
Value of offensive power at end 9th period.....	A	387	393	397	401	403	408	410	415	417	422
	B	387	358	328	298	268	239	212	184	160	137
Damage done in 10th period by.....	A	39	39	40	40	41	41	42	42	43	43
	B	39	32	26	21	16	12	8	6	3	1
Value of offensive power at end 10th period.....	A	348	354	357	361	362	367	368	373	374	379
	B	348	313	276	239	208	168	134	101	67	32
Damage done in 11th period by.....	A	35	35	36	36	36	37	37	37	37	38
	B	35	28	23	17	12	8	5	3	2	1
Value of offensive power at end 11th period.....	A	313	319	321	325	326	330	331	336	337	341
	B	313	271	226	183	139	98	57	19	0	0
Damage done in 12th period by.....	A	31	31	32	32	33	33	33	34	..	..
	B	31	24	18	13	8	5	3	1	..	..
Value of offensive power at end 12th period.....	A	282	288	289	293	293	297	298	302	..	..
	B	282	232	179	128	77	29	0	0	..	..
Total damage done by.....	A	718	768	821	872	923	971	1000	1000	1000	1000
	B	718	631	545	466	385	312	249	179	116	68

TABLE III.

		Column 1.	Column 2.	Column 3.	Column 4.	Column 5.	Column 6.	Column 7.	Column 8.	Column 9.	Column 10.
Value of offensive power at beginning..	A	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	B	1000	900	800	700	600	500	400	300	200	100
Damage done in 1st period by.....	A	100	90	80	70	60	50	40	30	20	10
	B	100	90	80	70	60	50	40	30	20	10
Value of offensive power at end 1st period.....	A	900	910	920	930	940	950	960	970	980	990
	B	900	810	720	630	540	450	360	270	180	90
Damage done in 2d period by.....	A	81	74	66	59	51	43	35	26	18	9
	B	81	74	66	59	51	43	35	26	18	9
Value of offensive power at end 2d period.....	A	819	836	854	871	889	907	925	944	962	981
	B	819	736	654	571	489	407	325	244	162	81
Damage done in 3d period by.....	A	67	62	55	50	44	37	31	23	16	8
	B	67	62	55	50	44	37	31	23	16	8
Value of offensive power at end 3d period.....	A	752	774	799	821	845	870	894	921	946	973
	B	752	674	599	521	445	370	294	221	146	73
Damage done in 4th period by.....	A	56	52	48	43	38	32	26	20	14	7
	B	56	52	48	43	38	32	26	20	14	7
Value of offensive power at end 4th period.....	A	696	722	751	778	807	838	868	901	932	966
	B	696	622	551	478	407	338	268	201	132	66
Damage done in 5th period by.....	A	49	45	41	37	33	29	23	18	12	6
	B	49	45	41	37	33	29	23	18	12	6
Value of offensive power at end 5th period.....	A	647	677	710	741	774	809	845	883	920	960
	B	647	577	510	441	374	309	245	183	120	60
Damage done in 6th period by.....	A	42	39	36	33	29	25	21	16	11	6
	B	42	39	36	33	29	25	21	16	11	6
Value of offensive power at end 6th period.....	A	605	638	674	708	745	784	824	867	909	954
	B	605	538	474	408	345	284	224	167	109	54
Damage done in 7th period by.....	A	37	35	32	29	26	22	18	15	10	5
	B	37	35	32	29	26	22	18	15	10	5
Value of offensive power at end 7th period.....	A	568	603	642	679	719	762	806	852	899	949
	B	568	503	442	379	319	262	206	152	99	49
Damage done in 8th period by.....	A	33	30	28	26	23	20	17	13	9	5
	B	33	30	28	26	23	20	17	13	9	5
Value of offensive power at end 8th period.....	A	535	573	614	653	696	742	789	839	890	944
	B	535	473	414	353	296	242	189	139	90	44
Damage done in 9th period by.....	A	29	27	25	23	21	18	15	12	8	4
	B	29	27	25	23	21	18	15	12	8	4
Value of offensive power at end 9th period.....	A	506	546	589	630	675	724	774	827	882	940
	B	506	446	389	330	275	224	174	127	82	40
Damage done in 10th period by.....	A	26	25	23	21	19	18	13	11	7	4
	B	26	25	23	21	19	18	13	11	7	4
Value of offensive power at end 10th period.....	A	480	521	566	609	656	706	761	816	875	936
	B	480	421	366	309	256	206	161	116	75	36
Damage done in 11th period by.....	A	23	22	21	19	17	15	12	10	7	4
	B	23	22	21	19	17	15	12	10	7	4
Value of offensive power at end 11th period.....	A	457	499	545	590	639	691	749	806	868	932
	B	457	399	345	290	239	191	149	106	68	32
Damage done in 12th period by.....	A	21	20	18	17	15	14	11	9	6	3
	B	21	20	18	17	15	14	11	9	6	3
Value of offensive power at end 12th period.....	A	436	479	527	573	624	679	738	797	862	929
	B	436	379	327	273	224	179	138	97	62	29
Total damage done by.....	A	..	..	..	..	..	..	..	..	..	..
	B	..	..	..	..	..	..	..	..	..	..

TABLE IV.

A begins with twice the offensive power of B: B is supposed to present, by reason of smaller size and thicker armor, ¼ the effective target that A presents.

Value of offensive power at beginning	A	1000
	B	500
Damage done in 1st period by	A	25
	B	50
Value of offensive power end 1st period	A	950
	B	475
Damage done in 2d period by	A	22.5
	B	45
Value of offensive power end of 2d period	A	905
	B	452.5
Damage done in 3d period	A	20.5
	B	41
Value of offensive power end 3d period	A	864
	B	432
Damage done in 4th period by	A	18.5
	B	37
Value of offensive power end 4th period	A	827
	B	413.5
Damage done in 5th period	A	17
	B	34
Value offensive power end 5th period	A	793
	B	396.5
Damage done in 6th period	A	16
	B	32
Value offensive power end 6th period	A	761
	B	380.5
Damage done in 7th period by	A	14.5
	B	29
Value of offensive power end 7th period	A	732
	B	366

Such conditions as these evidently represent ships or forces, which would fight to a "draw." This seems somewhat surprising; but it is clear that the offensive powers of both would probably be reduced to zero at the same instant. This table seems to indicate that, in order to compensate for an offensive inferiority of 50%, the effective target exposed must be 25%.

ably not hit another, the conditions supposed in Table I, Column 2, are satisfied; the chances of hitting are identical for both contestants, and so is the damage done at every hit. Table I supposes that the chance of hitting and damaging does not change until the target is destroyed.

Table II indicates what would probably happen if two forces of equal offensive power but offering different effective targets fought with each other. In each column the forces are supposed to start with the same offensive power but with different defensive powers, except that on Column 1, the offensive and defensive

powers of both are equal. In Table II, Column 6, the targets opposed bear the ratio of 5 to 10; which means not necessarily that one target is 5-10 of the other target in surface, but that the probability is that, if each is exposed for a given period to a given artillery fire, one force will receive 5-10 as much injury as the other force. In other words, if one force receive an injury that may be expressed by 100, the other force will receive an injury that would be expressed by 50.

The conditions named in Table II, Column 6, may be illustrated in a mental picture of two ships of like dimensions, engaging in a gun fight on the sea, which have the same number and kind of guns in each broadside, and are served by crews of like efficiency, one of the ships being entirely unarmored, and the other armored just enough to reduce the effective hits by one-half, under the conditions of the fight. They may also be illustrated by two ships of equal gun-fire, but of such size and at such a distance apart, that the chance of hitting B is twice as great as the chance of hitting A. Tables I and II, when compared, show that decrease of target does not confer the advantage that proportional increase of effective power confers; that it is better to increase our offensive power by 10 per cent, even if we increase the chance of receiving injury by 10 per cent.

In Tables I and II, the chance of hitting and doing injury is supposed not to change, no matter how much the offensive power of the enemy is reduced, until that offensive power is reduced to zero. It is clear that this condition exists if ships themselves be considered as the targets, but not if their guns and men be considered as the targets. If the enemy's offensive force consists of ships so far apart, relatively to the range, that a shot missing one ship will not hit another, then no matter whether the enemy's force be ten ships or one ship, the chance of hitting and disabling a ship by a lucky twelve-inch shell remains practically constant, so that a force of 1000 can always do 100 units of injury in every unit of time. But if the target considered be guns and men so close together that a shot missing one may hit another, then the chance of doing injury decreases continually after injury begins to be done; that is, when there are only, say, one-half as many guns and men to be hit, a force of 1000 will probably do only one-half as much injury per unit of time as it would when the fight began; and the effective target will decrease proportionally

as the offensive power decreases. If, for instance, during the first period the enemy's offensive power is reduced from 1000 to 900, the injury that a force of 1000 can do in the next period will not be 10 per cent of 1000, but nine-tenths of this amount. Table III is constructed on this principle, and also on the principle that in a fight between ships alike in type, the effective target presented by a ship's offensive power varies with that offensive power; so that a ship of given offensive power will probably do only eight-tenths as much damage per unit of time to an offensive power of 800 as to an offensive power of 1000, because there would be only eight-tenths as much probability of hitting a gun or a man.

Table III would indicate that the stronger force will retain the arithmetical advantage that it had at the beginning, but that the ratio of offensive power will increase in favor of the stronger. This case is like the game of checkers, where, if one player gets an advantage of one and then exchanges piece for piece until the end of the game, he will have one piece left, after his adversary has lost his last piece.

But it is doubtful if Table III represents a probable case. Table I is probably nearer the truth; especially if the fire control be good, because the center of impact of a ship's fire can then be directed at one part of a ship until it be put out of action, and then directed at another part. It may be here pointed out that this ability to concentrate on a given part of a target ship until it be broken down, and then to shift to another part, is one of the crowning advantages of fire control.

A consideration of these tables has brought out very clearly to the writer's mind the fact that, in every fighting ship, the thing most to be desired is a maximum of offensive power and a minimum of liability to having this offensive power destroyed. Now if we are to design a ship which will satisfy this requirement, it is plain that we must put on that ship whatever thing it is that has a maximum of offensive power, combined with a minimum liability to being itself destroyed.

Sizes of Guns.—It is evident that the offensive power of a ship's battery is not to be measured by the energy of the projectiles she can throw in a given time, but by their ability to do harm to a probable ship of an enemy, and the offensive power it carries. If the offensive power were measured by the energy of the projectiles her guns can throw in a given time, we ought to put the

weight allowed for guns into as many and as small guns as possible; for the reason that the energy of a projectile thrown by a big gun is about equal to the aggregate energies of the projectiles thrown by smaller guns of equal aggregate weight, and the smaller guns can be fired more often. A twelve-inch gun, for instance, weighs about as much as eight six-inch guns, and a twelve-inch projectile has about as much energy as eight six-inch projectiles; but a six-inch gun can be fired also about eight times as often; so, that, in a minute, six-inch guns can fire projectiles having eight times as much energy as an equal weight of twelve-inch guns. *They also expend eight times as much ammunition.* But if the guns are too small to destroy our real target, which is the offensive power of our enemy (*i. e.*, his turrets with their contents) and his water-line, *this energy is wholly wasted.* Therefore, our war ships ought not to carry any guns that cannot penetrate the water-line armor and protective deck of the battleships of any probable enemy at the probable fighting range and angle of striking; and as even twelve-inch projectiles, which are the most powerful projectiles now practicable, can barely do this, and cannot penetrate a modern turret at long range, but can give a greater shock than any other guns; and as smaller guns cannot be relied on to penetrate the water-line armor and protective deck we are simply logically restricted to twelve-inch guns.

Another reason for having a few big guns, instead of many small guns, is that the shock of firing even one three-inch gun on board even a battleship is so great as to prevent the use of a range-finder for several seconds; and the smoke given off is so considerable, that, except under very favorable conditions, a ship that keeps firing many guns can never get out of her own smoke, and give the gun-pointers a good chance. But the strongest reason for using big guns is that, at the long ranges at which future gunnery battles will be fought, exact knowledge of the range will probably never be had; and the bigger the gun the less its error, due to incorrect measuring of the range.

The fact that all turrets have ports of considerable size and weak tops, and that the upper decks are necessarily weak, indicates the desirability of having, in addition to the heavy guns, a number of small rapid-fire guns, to attack the target ship with high-angle fire. This attack will be especially valuable, when the target ship is making the bow presentation, and offering a

long horizontal target. Since great accuracy cannot be attained, a great number of shots per minute will be needed. This means, of course, that we should use the smallest guns that will insure penetration; not only because small guns can be fired oftener than large guns, but because more can be installed. The penetration will, of course, increase with the range, because the angle of fall increases.

We see, therefore, that there should be two sizes of guns in battleships; the most powerful that can be built and handled; and the smallest that can penetrate a turret-top and upper deck.

Steadiness of the Gun Platform.—But the offensive power of the ship's battery depends, not only on the power of the projectiles themselves, and the accuracy of the gun itself, but on the accuracy with which the gun is fired. Now, as the principal error in firing guns at sea is that due to the rolling of the ship, and is caused mainly by the fact that there is a variable interval of time between the instant when the gun-pointer wills to fire and the time when the gun is actually fired, during which interval the ship is rolling and continually changing the elevation of the gun, we see that the offensive power of the battery of a ship is tremendously dependent on the way in which the ship rolls. If a ship is rolling two degrees per second, Alger's tables show that the vertical error at the target is nearly twice that which it is when the ship is rolling one degree per second; so that, if the target is quite distant, the chance of hitting the target with the ship rolling one degree per second may be said to be practically twice as great as if the ship were rolling two degrees per second; unless the gun-pointer waits an indefinite time, until he can fire with his sights resting on the target. In other words, if two ships fight at long distance on the sea, and are equal in all respects except that one rolls twice as much as the other, that ship's offensive power may be truly said, under those conditions, to be only about half as great as the other ship's offensive power. This means that we must make our war ships to roll as slowly as is consistent with a safe metacentric height. Now as this small rolling must be accomplished in the ordinary conditions we meet upon the ocean, we see that we must make our war ships very massive and broad. The importance of great steadiness may be modified if we ever attain a mechanism and skill that will make "continuous aim" a reality with twelve-inch guns.

Height of Guns.—The inevitable disaster and defeat which would overwhelm a fleet with low guns, caught with the lee-gage in a heavy wind and sea, shows the necessity of having our guns high enough to permit their being fired accurately to windward, under all probable conditions.

We may assume it as a principle, therefore, that the ships of our battle-fleet must be equipped with as heavy guns as can be made and handled well; must be themselves very massive and broad; and must carry their guns very high.

Defensive Power.—It has already been said in this paper that it seems as if our ships should have the maximum of offensive power, combined with the minimum liability to having that offensive power destroyed. This may be stated by saying that the ship should have maximum offensive power and present the minimum *effective target.* By the phrase "effective target" is meant to be conveyed the idea, not only of exposure of area, but also of penetrability; so that if two ships present exactly the same area to gun-fire, but one of them has her offensive units so disposed and protected that, if both ships were exposed to a given gun-fire for a given time, only one-half as much damage would probably be done to one ship as to the other, that ship may be said to present one-half the effective target that the other presents. The office of armor is clearly to decrease the effective target to an amount that depends on its impenetrability. It is plain that the more and the better armor we can put on a war ship, the less the effective target becomes.

A recognition of the existence of effective targets brings us at once to realize that it is better to use machinery as much as possible in our ships, rather than men; because machinery exposes less effective target per horsepower than men. Not only does it present less area, but it is less easily damaged, is more easily repaired, and can more easily be stowed in a safe place behind armor. And the delightful amenability of machinery to discipline should not be overlooked; machinery has never been known to be out of uniform, or overstay its liberty, or get drunk.

Dispersion of Target.—But a slight consideration of the subject shows us that the effective target may be decreased by other things than armor. If a great number of projectiles are fired under ordinary conditions at a target from a gun on board a rolling ship, and if a rectangle be drawn around the points where the

projectiles strike, the rectangle will be found to be higher than wide, because the vertical errors of a gun fired on the sea are usually greater than the lateral errors. Therefore, if we wish to make a target of given area that will catch the maximum number of projectiles fired at it from ships, we must make this target higher than wide. Therefore, the *worst* disposition to make of the important stations on board our battleships, is to place them under or over each other, or nearly so. Placing important stations nearly over or under each other increases the effective target.

The lateral errors of guns fired at sea also are very considerable, especially at great ranges; but they can be made much less than the vertical errors by a good system of fire control. If a ship's battery, fired under given conditions, say at four thousand yards, can put all its projectiles in a vertical area m feet long by n feet high, then any ship that presents that target, and engages with her at that distance, will catch all the projectiles fired at it, after the fire control has put the center of impact on the center of the target. But if this area, instead of being a continuous target which will receive injury if struck anywhere, contains only a few stations whose disablement would cause damage, then the chance of the target ship being damaged will not be the chance of the whole area being hit, but the chance of those stations being hit and damaged. In other words, the effective target presented by a ship can be reduced by dispersion; by breaking the target up into units, separated as far as practicable.

Units of Offensive and Defensive Power.—We see, therefore, that we may assume it as a principle that, in our ships, we ought to use the largest guns practicable; put as many of them in a ship as practicable; armor them as much as practicable, and separate them as far as practicable. In plain language, this means that the offensive power of our war ships should consist of twelve-inch high-power guns, installed in turrets that can keep out twelve-inch capped projectiles at battle ranges; and that each turret with its guns should be regarded as a *unit*. There seems to be no escape whatever from the conclusion that we should recognize this combination as our *unit of offensive and defensive power*, and that our battleships should be equipped with these units and with these only. This does not mean that there should not be a secondary battery, and as large a one as is practicable, for keeping off torpedo-boats, and for attacking the tops and ports of turrets; but

this matter, while of importance, is of secondary importance, and sight should not be lost of this fact.

It is held by some that even the secondary battery guns should be in turrets; that all guns should be in turrets; that whatever line of reasoning leads us to turrets for big guns leads us to turrets for small guns.

Maximum Vulnerability Plan.—Many of our best ships are not designed on this plan, which may be called the "all turret plan," but are designed on what may be called the "maximum vulnerability plan," by means of which it is made impossible for a heavy projectile to hit the ship anywhere between the forward and after turrets, without destroying some part of the offensive power. Instead of having a small number of very powerful, very manageable, and strongly protected turrets, a lot of medium guns are placed very close together, and are served by several hundred men. It is not pleasant to imagine what would happen to those men in battle. And it must be borne in mind that, entirely apart from the question of damage done to men, guns, and mechanism, considered as a part of the offensive power of the ship, is the effect on the morâle of the unhit men of seeing their shipmates killed and maimed. Even with the bravest and best disciplined men, the losing force cannot keep on fighting until it has been reduced to zero. No force has ever done so; when the offensive power has been reduced to, say a quarter, the resistance of the personnel has usually collapsed; if, indeed, it has ever held out so long. This is merely because the men not hurt have seen other men killed and maimed, and heard their cries, and smelt their blood. But if they were not brought into contact with them, if the men were segregated in turrets, so that those in one turret which was not hit could not see those in another turret which was destroyed, the ship would be able to keep on fighting until men and guns were well wiped out. This element alone would increase a ship's fighting power more than 25 per cent.

Protection of the Directing Personnel.—Closely connected with the question of target is the exposure of the directing personnel, including the captain, signal corps, and such others as the captain finds necessary to have near him. Our evolutions at fleet drill are always carried on with a great number of people on the bridge. Now where would these people be in a fleet fight? It may be answered that they certainly would not be on the bridge. If this

be the case, either their presence on the bridge is not necessary in our fleet drills, or else managing our ships in a fleet fight will have to be carried on without the assistance of some men on the bridge whose assistance would evidently be desirable, and on which we have become accustomed to depend. It would seem as if there had not been any determined effort to make it possible to maneuver our ships in fleet evolutions while under fire; and yet every officer knows that our ships *must* be maneuvered in fleet evolutions, while under fire. The problem seems to be so hard that everybody has simply recoiled before the attempt to solve it. It is suggested that a determined effort should be made to provide armor for the captain and at least one-half a dozen others, so placed that they can see what is going on, by using vertical telescopes. In the German army, officers are provided with vertical telescopes sometimes called periscopes, with which they can look over armor, and still be protected. It would be easy to adapt this idea to battleship construction. In fact, it is perfectly practicable to use vertical telescopes, not only in such places as conning-towers, but in torpedo-directing stations, and as telescope-sights in turrets; thereby getting rid of the very vulnerable "sighting hoods."

Hull Armor.—The armor on the turrets is for the protection of what may be called the offensive power of the ship, including the guns and men. The armor on the hull, including the protective deck, is for the purpose of protecting the ship as a unit; and, to do this, it is clear that the water-line belt and protective deck, together, must be able to keep twelve-inch capped projectiles out of the ship's vitals at battle ranges. It is clear that we may fire at a ship, and hit her many times, and yet may not do any real damage whatever, so far as lowering her offensive power, or reducing the efficiency of the ship, as a carrier of that offensive power. If the ship is constructed as many armored cruisers are, and as some battleships are, in such a way that a projectile can hardly strike anywhere without killing some men or injuring some guns, that ship will evidently be at a great disadvantage as compared with another ship, in which the offensive units are adequately armored, and have large spaces between them. It would seem that a ship could be so constructed that no harm would really be done, if she were struck by a heavy shell; unless that heavy shell, at close range, hit a turret, the conning-tower, a mast, the base of a smoke-

stack, or the water-line; in fact, a monitor approaches this condition very closely. In this case, the only external armor for the hull would be along the water-line; and it would seem to be a positive advantage if the rest of the hull were not made very resisting, because many projectiles might pass through the ship, without doing any damage whatever. This would save a great weight of armor that could be utilized in giving substantial protection to the water-line, by a belt extending considerably above and below it. It may be pointed out here that the term "water-line," as ordinarily used, means the water-line of a ship, when lying at anchor in smooth water; but that the water-line of a ship, when she would be fighting in a sea-way, would be entirely different, and would be much higher forward. For this reason, it would seem that the forward ends of our ships are not really protected so much as they seem to be; because a heavy shell, striking even two feet above the belt forward, would probably cause the whole berth deck to fill with water; thus altering the trim of the ship, interfering with her maneuvering power, cutting down her speed, and embarrassing the entire fleet.

The comparison is often made between the battleship and the ancient knight in armor, saying that, as the progress of time caused the knight to give up his armor, so will it cause the battleship to give up its armor. He would be a daring man who would declare whether this prophecy will come true, or not. But it may be pointed out that the carrying of armor by men was discarded because the progress of invention increased the penetrating power of the projectile so much more than it did the resisting power of the armor, that the armor ceased to fulfil the purpose which it had fulfilled before, and which caused it to be used. If the progress of invention in ship armor and ship ordnance follows like paths, so that armor for ships becomes useless, then armor for battleships will probably be discarded.

Protective Deck.—The disaster to any ship that would follow the entrance of a heavy projectile into a magazine, boiler, engine or steering compartment, indicates the necessity for a protective deck strong enough to keep out twelve-inch projectiles, at probable battle-ranges. The plan, now favored by some constructors, of using heavy side-armor instead, must be based on the notion that ships will always fight broadside on, and never receive high-angle fire, like the Russian ships at Port Arthur.

Of course, a sufficient protective deck and water-line belt will weigh enormously, but we absolutely must have them, or come as near having them as possible.

Specially Designed Flagships.—The battles of Manila, Santiago, and Port Arthur show that flagships will be specially attacked, as is natural, and for reasons that are plain. The same reasons that will lead the enemy to attack our flagships make it necessary for us to protect them; and the only possible way is to keep them out of the battle-line. The necessity is here suggested of making specially constructed flagships, very large and fast, with adequate high belt-protection at the water-line, but very lightly armed; with an admiral's observing station very high up, like Farragut's, and signal masts 200 feet high, well above the funnel smoke; the flagship *not* ordinarily to join in the battle, but to be to "leeward," like a general in rear of the fighting line. It is silly to suppose that any of our flagships could lead the column in a fleet fight *with an enemy of the kind that we must prepare to meet,* and escape quick disablement. Will the fleet then stop to be *T*'d, or will it leave the useless flagship to its fate?

The question of how to provide an admiral with means to fight his fleet, is the most urgent and unsolved question before the navy to-day; and yet, we do not even think about it. We have given every man in the fleet a means with which he can do his allotted work, *except the admiral.* He has not even a station fitted for him. Dewey stood, absolutely unprotected, in the best place from which to direct the fleet. But it was not the place intended for him. *There was no place intended for him!*

Why lavish brain power and money on every thing except the most important thing of all, the culmination of all; the thing without which no fleet can be a fleet, except in name? Why devote the highest order of constructional and ordnance and engineering skill to developing every detail to the utmost perfection of perfection, and then, when we come to handling the final result in its final test, simply trust to luck? This is exactly what we will do, if we put our admiral up on an unprotected bridge of a flagship on the fighting line. This matter will be considered later in its relation to naval tactics.

Torpedoes.—The recent great improvement of the auto-torpedo in mechanism, speed and range has introduced a very important, and very serious, complication into the question of fights between

fleets at sea. The torpedo, like the printing press, has overcome "conservatism," and is now an accomplished fact. Its future no one but a prophet can foretell, yet a very ordinary man can truly say that there is more progress in sight for it than for the gun. The gun has not improved very much in the last ten years in comparison with the way in which the torpedo has improved in the same time; and, until some new discovery is made, which is not now in sight, the gun cannot improve very much in accuracy, rapidity or range. But the torpedo seems to be in its infancy. Only a very short time ago, its effective range was supposed to be eight hundred yards; and now two torpedoes are being made which are expected to go four thousand yards at twenty-six knots speed. The torpedo, being simply a cigar-shaped boat propelled by an air engine, can be made to go eight thousand yards at twenty-six knots, if fitted with a sufficient air-flask; or a very much greater distance, if run at less speed. If an automobile carriage can go fifty miles over the ground, an automobile-torpedo can be made to go fifty miles through the water. It is merely a question of energy. Regarding accuracy, we all know that, while the gun has errors in two planes, vertical and horizontal, the torpedo has, practically speaking, only one error; that in the horizontal plane. And while the great enemy to the accuracy of the gun is the rolling of the ship, we know that, practically speaking, this has almost no influence on the torpedo. And when we think about the question of a fleet fight, which is the most important question that the naval officer has to think about, it is fair to say that, if a torpedo is fired at the middle of a fleet, there is about one chance in three of hitting some ship; and that, if it hits some ship, that ship will probably be disabled. This, of course, is supposing the fleet to be in some formation that is close enough for fleet fighting.

It is idle to say that a torpedo will not sink a ship if she has her water-tight doors closed; because the mere disabling of a ship, without sinking her, will cause her speed to decrease very much, and this will affect the whole fleet; because the whole fleet must either slow down, and lose all the advantage that speed gives, or else, must leave the ship behind. This would mean, not only that the ship would be taken by the enemy, but also that the fleet itself would be reduced in numbers.

Therefore, the enormous destructive power of the torpedo, and

its extraordinary accuracy, and the almost limitless possibilities of improving it, lead us to accept it as a principle, that the ships of our fleet must be as thoroughly equipped with torpedoes as can be done; and that we must push the improvement of the torpedo to its utmost possible limit.

The importance may be here suggested of keeping the range and speed of our future torpedoes a very strictly guarded secret; so that the enemy will not know how far to keep away to be beyond torpedo range.

Large Ships or Small Ships?—In discussing the events that would occur between our two fleets at sea, it has practically been assumed, thus far in this paper, that the ships on the two sides are equal in size; at least, no mention has been made of any difference in size.

The question has often been discussed, whether it is better to have a small number of large ships, or a large number of small ships; the aggregate tonnage in the two cases being the same. This would amount to discussing whether, in the case of our two fleets, it would be better to have sixteen ten-thousand-ton ships or eight twenty-thousand-ton ships. It is not very hard for us to see, in our mind's eye, sixteen ten-thousand-ton ships, drawn up against eight twenty-thousand-ton ships. For the reason that a ship's tonnage varies practically as the cube of her dimensions, the ships of twenty thousand tons would each be about one and three-tenths times as long and high as the others; thus exposing to gun-fire about one and seven-tenths times as much target, considering the hull as the target, and twice as much target, considering the offensive power as the target. If, however, the important positions were properly dispersed, and the enemy's fire-control good, a ship of twenty thousand tons would present little more effective target than a ship of ten thousand tons. The column of twenty-thousand-ton ships would be about three thousand yards long; and the column of sixteen ships about sixty-two hundred yards long. This is on the assumption that there would be about four hundred yards between the mainmasts of the ships of both fleets, as would probably be the case. The twenty-thousand-ton ships would be more steady as gun platforms than the ten-thousand-ton ships, in most sea-ways; they would carry their guns higher; they would be able to carry more than twice as much offensive power, both in guns and torpedoes; they would have

more powerful engines, and they would be faster. That is, the aggregate offensive power of the eight twenty-thousand-ton ships would be greater than the aggregate offensive power of the sixteen ten-thousand-ton ships. The armor protection would be greater also, and in a ratio greater than the ratio of the effective targets exposed. The possession of superior speed would enable the big ships to get the advantage of position, as regards the wind and sea; to begin and end a battle when they pleased; and to keep always near the head of the column of the enemy; so that the statement just made that the aggregate fighting power of the twenty-thousand-ton ships would be greater than the aggregate fighting power of the ten-thousand-ton ships, must be strengthened by the statement that the twenty-thousand-ton ships could take up such a position near the head of the column of the ten-thousand-ton ships, that the rear ships of the slower fleet could not use their guns effectively at the faster ships. Should the column of the ten-thousand-ton ships swing into line, the faster fleet could simply *T* it, (flank it), and disable each of the slower ships, one after the other. The sixteen ten-thousand-ton ships could not help being flanked.

To the advantages just enumerated, must be added one equally important; which is that the big ships could keep a little ahead of the smaller ships, and fire their torpedoes, so that the slower ships would run into them.

In the matter of defense against torpedoes, the bigger ships would have the advantage, for the reason that big ships *can* be divided into as small compartments as small ships; with the result that an explosion in a compartment in a big ship would not damage the big ship so much as an explosion in a like compartment in a small ship. Furthermore, torpedo armor might be practicable in a big ship that would not be practicable in a small one. It is true that we have not, at present, any real torpedo armor; or, in fact, any real defense whatever against torpedoes. But it is inconceivable, that, in the present state of the engineering arts, some defense, partial though it be, will not be made against torpedoes. This defense, it seems probable, will be of the nature of a sort of outside bottom, not too strong, which will prevent the war-nose of the torpedo from striking the hull of the ship proper. An appliance of this kind, to be efficient, will, of course, require a certain minimum distance to be left between the

outside skin and the hull proper, so that there will be a large air-space that will be useless for carrying coal, ammunition and stores. It is clear that this waste space can be better spared in a large ship than in a small one. The necessity for omitting the center-line bulkhead is a little more urgent, the smaller the ship.

It has been said by some that our fleet should consist of battleships of very moderate size, for the reason that a small ship can ordinarily be handled better than a big ship. But two small ships cannot be handled better than one big ship; no ship can collide with itself, nor can a fog be so dense as to prevent signals being understood between the parts of any one ship. The whole effort of fleet drill is to get co-operation among its various units; and the difficulty of obtaining this co-operation increases with the number of units. A "reductio ad absurdum" of this principle would be to declare that we ought to build one battleship so big that it would equal the tonnage of say sixteen ten-thousand-ton battleships. But this would be a "reductio ad absurdum" for one reason only; and that is that such a ship is beyond the state of the engineering arts to-day. But, if such a ship could be built, a ship of one hundred and sixty thousand tons, which would be as perfect as a ship of ten thousand tons, she certainly could whip sixteen ten-thousand-ton ships in an ocean fight. By her superior speed, she could take one ship at a time, isolating the others, and thus disable the sixteen smaller ships, one after the other.

Regarding the economy of the two plans, it is well known that battleships cost less per pound, the bigger they are; so that one twenty-thousand-ton battleship would cost less than two ten-thousand-ton ships; and as one twenty-thousand-ton ship will need fewer men than two ten-thousand-ton ships, we see that economy, both of money and of men, will be promoted by putting our naval force into very large ships.

We may accept it as a principle, therefore, that we should make our battleships as large as the state of the engineering arts permits.

This means that we shall have to keep making them larger and larger, for the present. To do this, it will not, of course, be desirable to depart from standard types; it will, on the contrary, be clearly desirable to decide on a type of ship, and afterwards, from year to year, enlarge and improve it; but making no changes in design that are not *sure* to be improvements. At the present moment, it seems clear that we should build ships of *at least* twenty thousand tons, having a speed of at least eighteen knots.

An incidental advantage of a very large ship, manned by a comparatively few men, would be the greater amount of breathing space per man, better opportunity for exercise, better protection from the weather, better opportunity for having dry clothes ready, better health conditions in general. It is a common idea of people who live habitually on the land, and take sea-trips sometimes for their health, that the naval life must be a very healthy life. They do not know the incredibly crowded condition of the places where a man-of-war's-man sleeps; they do not know that he has to spend a great deal of his time in wet clothes; that he is exposed to very sudden and very great changes of temperature; that he spends a great deal of his life in the tropics, in a ship, most parts of which are then about ten degrees hotter than the air outside, and in which the ventilation cannot be made sufficient. But if they did know these things; and if they appreciated the importance of being able to put real gladiators into our fleet fight, men whose physical and nervous endurance had been developed to the highest pitch, they would then appreciate the importance of surrounding them with health conditions of the highest class; and these cannot be attained on board of any but a very large, uncrowded ship.

It may be interesting to note here that the causes which have operated to distribute armies into small units over a long fighting line can operate only imperfectly to distribute naval forces into small units; for the reason that, although dispersion of target has the same value on land and sea, yet the concentration of troops in large masses on the land does not give the same advantages of increased speed, armament, protection and manageability, that the concentration of naval force does in large ships on the sea.

Armored Cruisers.—Regarding armored cruisers, as now designed, it may safely be stated that their place in naval warfare is not accurately defined. It is admitted by all that they have "great steaming radius;" that they can make "reconnaisance in force;" that they can make "raids;" and a notion seems to be held by a few officers that their particular combination of light armor, light armament, and great speed, must result in something very valuable; since they cost as much money as battleships, are more expensive to maintain, and need more men. But this feeling is vague; no one seems able to state the particular probable occasion when that particular combination would be as valuable as the

combination found in a battleship. If the United States were dependent, in the way Great Britain is, on an enormous number of merchant ships that it would have to convoy in time of war, the expenditure of so much money, and so many men, on lightly armed and inadequately armored cruisers might be explained. But we have no such enormous number of merchant ships to convoy; the duty of our navy in time of war will simply be to fight. Therefore, the building of ten armored cruisers, like ours, with insufficient powers of both offense and defense, in preference to ten magnificent battleships, would seem to be a mistake. Now, as these ships are exceedingly good as ships, the mistake would clearly seem to be, not an engineering or constructional mistake, but a military mistake. It would seem to be a mistake made by men who had devoted more study to engineering than to strategy.

The value to a fleet of ships having greater speed than the battleships, but with less offensive power, is not to be denied; but it must be clear that such ships must have enough water-line protection, in belt and protective deck, to prevent their disablement by one shot. This can, of course, be given, even to the armored cruisers already building, by taking off the intermediate batteries and side armor, and thickening and widening the belt at the water-line. The expense of the change would be enormous; but this expense should not be charged to the change, but to the original design, which made the change necessary.

Homogeneity and Progress.—It may be pointed out here that, while homogeneity of ships in a battle-fleet is an ideal towards which we must persistently strive, yet we should recognize the fact that, like most ideals, it is unattainable. The enormous speed with which the engineering arts are advancing, coupled with the long time needed to build a battleship, brings about the condition, not only that changes must be made in ships built in a certain year, over those built the year before, but that changes must be made frequently in every ship *during her building*, no matter how much exasperation and trouble those changes may occasion. We may as well realize the principle that *homogeneity and progress cannot co-exist.*

We must not forget, however, that the only very important ways in which the ships of a fleet should be homogeneous are equality of turning circles and speed. So long as we can approach satisfactory homogeneity in these two features, we shall probably do

well to accept all possible improvements in the details of ordnance, construction and equipment.

Torpedo Vessels.—The fact that the Japanese have had torpedo vessels with their fleet in their war with Russia is a sufficient reason for considering it a reasonable plan. It is apparent that, *if the weather be fine,* torpedo vessels, even in a fleet fight, could be kept on the side of the fleet away from the enemy, far enough away to be safe; and that, while they might not take part in the main battle, they would be very useful in torpedoing disabled vessels of the enemy which would not surrender; in chasing fleeing vessels of the enemy, in case the enemy's fleet is broken up; or in defending our own disabled vessels from being torpedoed by the enemy. If the weather were bad, however, they could not even keep up with the heavy ships; so, if torpedo vessels are to be part of our battle-fleet, they must be much larger and heavier than destroyers are at present; and as it would not be necessary to have them go so fast in smooth water as at present, their engines may be less powerful in proportion to their tonnage. It may be here suggested that it would be worth while to consider a type of torpedo vessel which would not be so vulnerable to gun-fire as the present destroyer is; which would have the engines and boilers below the water-line, covered by a protective deck; and which would have submerged tubes. It is true that such a torpedo vessel, if made so that it could be relied upon, would have to be of considerable size, at least four thousand tons; but a vessel of four thousand tons could maintain its speed in a sea-way and might be so constructed that its upper works could be completely riddled by gun-fire, and yet the vessel remain as good as ever for its purpose. It has even been suggested that our armored cruisers, now nearing completion, be converted into torpedo vessels, by taking off their six-inch guns and side armor, equipping them with ten submerged torpedo tubes on each side, and say one hundred twenty-one-inch torpedoes each, of great speed and range, and thickening the armor at the water-line to twelve inches. There are now ten armored cruisers building, whose usefulness, as part of our battle-fleet, has long been doubted by many officers, and has been more doubted still since the fate of the Russian Vladivostock squadron. But ten torpedo vessels with twelve-inch water-line protection, each with ten submerged tubes on the side, each carrying one hundred twenty-one-inch torpedoes that could

go four thousand yards, *or more*, at a speed of twenty-six knots, *or more*, would have a definite fighting value. With a torpedo squadron of such vessels at each end of the fleet, a commander-in-chief would not have so much anxiety about being flanked, or T'd, as he would without them.

Submarines.—By removing a few six-inch guns from the battleships, where they can do but little good, it would not be difficult to give each battleship a submarine, with proper means to get it in and out. But submarines will have to be longer, deeper, and faster than at present, to do much good in a fleet, except in operations near a coast.

Auxiliaries.—If by auxiliaries is meant vessels that belong to the fleet, but do not take part in the active fighting, they may be said to include scouts, colliers, ammunition ships, repair ships, supply ships, hospital ships and cable ships.

Scouts.—The use of scouts is to get information. It is evidently desirable that the commander-in-chief of our fleet should get as much information as possible; but it may be pointed out that scouts are not so much needed now as they were in the days before cables and fast mail ships and wireless telegraphy were in use; because scouts were then the only means by which information could be got. In nearly every case that would be probable in the near future, when wireless messages can be exchanged between ships two hundred miles apart, the information which scouts can get would be gotten at some time without scouts; so that it may be said truly that the only value of scouts will be to get information quicker than it would be gotten otherwise. It is true that information which is gotten too late may be worth nothing; so, the last statement may be modified by saying that the only value of scouts is to get information that could not be gotten quickly enough by any other means. Now, it is apparent that the information which a scout will get will almost always be gotten by seeing a certain number of the enemy's ships going in a certain direction. In very many cases, this information would be of value; but it may be pointed out that, at the same time that the scout would see the enemy's ships, the odds are heavy that those ships would see the scout; and that the information conveyed to the enemy by seeing the scout, might, in many cases, offset the value of the information that the scout would get; and it is possible that, in some cases, the information given to the

enemy by seeing the scout might be of much greater value to the enemy than the information given to the scout's admiral.

It is also to be borne in mind that the scout may make a mistake as to what he sees; that his means of getting accurate information can rarely be very good; and that his report to his commander-in-chief may be erroneous and misleading, and therefore worse than useless. That this may happen is proved by the fact that it has happened.

Now, if before the war, we allow our ships, and squadrons, and fleets, and auxiliaries, to become widely separated, and then try to get them together, information of what the enemy is doing may be of the very first importance; but if we get our entire fleet together before the war begins, and drill it until it can be handled as a unit, which will probably be the case; and if our enemy does the same thing, which will probably be the case, it is apparent that the value of scouts will not then be so great. Their principal value then will be in bringing the two fleets to battle before they would otherwise be brought to battle. This is because no great fleet will waste its energies on anything less than the other fleet.

In the case that one fleet is gotten together before the war, and the other not, it is clear that scouts will then be of more value than if both fleets had already been formed. In this case, scouts will probably be more used by the concentrated fleet than by the disconnected squadrons; for the reason that each disconnected squadron will be so fearful of being caught alone by the concentrated fleet, that it will keep its ships together and try to sneak along to the rendezvous, taking up as little space as possible.

Scouting, therefore, while important, must be considered as one of the minor operations of naval warfare. If this be true, it follows that we should expend as small a part of our naval force as possible in scouts. And for the reason that scouts must, of necessity, be able to stay a long time at sea, and go fast from place to place, they must be massive and carry a great amount of coal. In our war with Spain, vessels like the Yale and Harvard made excellent scouts. Their great mass enabled them to keep up their speed in any kind of seaway; their large bunkers enabled them to stay long at sea; they could always be relied not to break down, and the fact that they looked like merchant ships masked somewhat their identity. It would seem, therefore, as if our *ordinary* scouts should be vessels like the very large Atlantic liners.

But, as they must be under the orders of the commander-in-chief afloat, and as they must be able to make and read signals of all kinds, it is clear that it will be necessary to put on board, say two officers, and a few naval signal-men, in addition to the regular merchant ship crew. The merchant crew and captain can be enrolled as part of the Volunteer Navy.

The fact, however, that the enemy will seek to prevent scouts from getting information leads us to see the value of what may be called "military scouts;" vessels which are so strongly armored and armed that they cannot easily be driven off. Therefore, in addition to the ordinary scouts, we need a few military scouts.

As the first requisite of all scouts is that they shall be able to see, it is clear that special attention must be paid to constructing observing stations, where telescopes can be mounted. Inasmuch as the worst enemy to seeing by telescope is vibration, we see that it is absolutely essential to a good scout that her observing stations shall not vibrate when the scout is going at the speed at which she will probably be going when doing her destined duty. To accomplish this, it is clear that the observing stations should be very substantially constructed, that the ship should be very strongly built, and that the engines should be balanced with exceptional care. This point indicates at once the desirability of using turbines.

Colliers, etc.—If one of the two fleets went into battle with a great deal more coal than the other, and if the operations lasted a long time, say several days, it is possible that one fleet might get practically out of coal, while the other had plenty. What would happen to the fleet which ran out of coal may be imagined. It is apparent, therefore, that our fleet should keep as full of coal as possible. The only way to accomplish this is to have colliers with the fleet all the time.

The same reasoning applies to ammunition ships, supply ships, and repair ships.

Inasmuch as these auxiliaries must accompany our fleet, and inasmuch as it would be foolish to build a fast fleet of fighting ships, and then hold it back by slow auxiliaries, we see that these auxiliaries must be so large and so well-engined that they can keep up with the fleet in all kinds of weather.

It may be objected that the presence of a lot of helpless auxil-

iaries would only embarrass the commander-in-chief, who would have enough to do to look out for his fighting ships. Their presence would undoubtedly embarrass him at times; but some one must look out for the coal and supplies that the fleet will need, and the officer who has our entire fighting force under his command can do it better than any one else; and he can do it well, in proportion to their nearness to him; and their nearness to him will be at its maximum when they are actually with him, and in sight from his flagship.

It may further be objected that our various shore bases and coaling stations are arranged to furnish our fleet with supplies and coal, and that other means would be unnecessary. This argument is powerful and some shore bases must be had; but the commander-in-chief cannot always go instantly to a shore base or coal pile; and he cannot be assured that, when he gets there, he will find any coal; he cannot be assured that the enemy will not have set fire to everything in the place.

This suggests the curious fact that any shore base, not protected so well that it can withstand a probable enemy, is an element of weakness and not an element of strength. The reason evidently is that men must be taken from our fighting force to guard it; our plans of war must be complicated by the necessity of including it; our naval force cannot always stay in sight of it; and, therefore, there will always be an element of doubt introduced by our own fear concerning it, and doubt carries with it uncertainty in planning; and finally if the enemy attack it, we shall lose something on which we relied, and in which the enemy will find something that he wants. Besides, there will follow the depressing "moral effect" that always follows any loss in war.

NAVAL TACTICS.

Naval tactics may seem, at first thought, to be unconnected with naval policy. But a little reflection suggests that no naval policy can be wise unless it takes into very careful account the tactics that ought to be used in war; in order that the proper kinds of ships may be built and the proper kinds of organizations, drill and discipline be devised, to carry those tactics into good effect.

Returning to our mental picture of two hostile fleets, operating in each other's presence on the sea, it is easy to imagine the intense feelings of every one; especially of the commanders-in-chief.

Each commander-in-chief will feel that his country has placed in his keeping the final result of all that it can do; that his fleet cannot be drilled any longer; that the courage and skill of his men are fixed quantities which cannot be altered now; that, although the skill, or lack of skill, of one or more of his subordinates may make a considerable difference in some emergency, yet, nevertheless, the final thing upon which the glory of his country will depend that day will be *his skill.* Surely, no matter how skillful he may know himself to be, in that grand, but neglected art of handling fleets upon the sea; no matter how well coaled and provided are his ships; no matter what confidence he may feel in his captains and their crews; the infinity of possible combinations of position and formation, of gain and loss, that the battle may assume, each requiring that he shall wisely act, will thrust upon his mind the awful question, can he rise to that sublime occasion?

It is clear that the aim of his tactics may be divided into three parts:

(1) To get his fleet into a favorable position.

(2) So to dispose his ships that he can direct his gun-fire and torpedo-fire most efficiently at each instant, at the enemy, as disposed at that instant.

(3) To put his fleet into such formations as to present the least possible effective target to the gun-fire and torpedo-fire of the enemy.

(1) If the fleets are on the ocean so far from land that the tactical problem is free from complications caused by it, the question of a favorable position is one that depends almost wholly on:

(a) The relation of the longest line that can be drawn through the vessels of one fleet to the longest line that can be drawn through the vessels of the other fleet; and in this regard, that fleet will have the advantage of position whose "longest line" is the nearest to being perpendicular to the direction of the middle of the other fleet. If both fleets are in column, or in line, or in echelon, for instance, the "longest line" in each is, of course, along the column, or the line; and if the two fleets are parallel, and bear from each other in a direction perpendicular to those lines, neither has, in this respect, the advantage of position. But if the *A* fleet is in column, or line, or echelon, and the *B* fleet is in the same formation, but with its column or line, perpendicular to

the direction of the *A* fleet and along the *A* fleet's longest line—prolonged—the *B* fleet clearly has the advantage of position; because all its ships can fire the guns and torpedoes of one side at the *A* ships, while only one *A* ship can fire all the guns and torpedoes of one side at the *B* ships. In this case, the *A* fleet, of course, is flanked or *T*'d; and the advantage of the *B* fleet is at the maximum. But it is clear that, in between the two cases just cited, there is an infinity of other probable cases, in which the gun-fire and torpedo-fire of the ships of one fleet is less obstructed by friendly ships than is the gun-fire and torpedo-fire of the ships of the other fleet.

(b) The strength and direction of the sunlight, wind and sea.

If the sunlight is very strong and the sun is low, it is apparent that, if one commander-in-chief can so dispose his ships that his gun-pointers have the sun behind them and illuminating their targets brightly, while the enemy's gun-pointers have the sun directly in their eyes, he will gain an advantage that may decide the fight. The higher the sun and dimmer the sunlight, the less, of course, will be the value of this factor.

If the wind be very light, its influence on the question of position may be small; but if the wind be strong and one commander-in-chief can get his fleet to windward of the other, he will score an important point; because there will be a great deal of smoke given off from the guns of each ship; and this smoke will be blown away from the weather ships, and blown back into the eyes and throats of the men in the lee ships. The lee ships will be very greatly embarrassed, and delayed in firing also, by spray thrown on the object glasses of the telescope sights; and, in some cases, they may not be able to use their weather guns at all. Especially will this be the case with our ships, many of which have their guns near the water.

The direction of the sea is important, both by reason of its effect in embarrassing the fire of weather guns, and by reason of its effect on the steadiness of the gun-platform. As is well known, a ship pitches less than she rolls; not only through smaller angles, but with a smaller angular velocity. And since we know that the error of the gun-pointer is mainly due to the angular vertical motion of his gun during the interval between the instant when he wills to fire and the instant when the gun is actually fired, we see that the direction of the sea must be an element in the calcu-

lations of the commanders-in-chief of the very first importance. For instance, if our commander-in-chief can get his fleet into column head to a heavy sea, with the enemy on his beam in line; or, if he can get his fleet into line, head to a heavy sea, with the enemy's fleet in column rolling in the trough, he will have a distinct gunnery advantage.

It may be objected that perfectly continuous aim would make the motion of the gun-platform an unimportant matter. This clearly is true; but while it is extremely probable that aim practically continuous with turret guns will some day be attained, it seems probable that until perfectly continuous aim is an established fact in all our ships, we ought not to disregard the advantage of a steady platform.

If the fleets are so near the land that its nearness must be taken into account, the problem may become complicated in the extreme. If the land be friendly, if his own harbors and monitors and submarine boats and forts be there, the commander-in-chief might not hesitate to get between it and the enemy, if it were not that he would heartily desire to get the enemy between it and him. But each fleet will try to be the offshore fleet; and this will clearly be the case, even if the land be neutral. An exception to this case would, of course, exist if either side wished to have a harbor of refuge under its lee.

The best position will evidently be gotten by the fleet that is the faster, unless the other fleet be the better handled; and even this rough sketching of the situation shows that, in the handling, there will be need for skill of the highest order on the part of the commander-in-chief, either in utilizing superior speed or in preventing the enemy from utilizing superior speed.

(2) In order so to dispose his ships that he can direct his gunfire and torpedo-fire most effectively at each instant, at the enemy as disposed at that instant, the commander-in-chief, it is clear, must take into principal account the strength and direction of the sunlight, sea and wind, as just discussed; but this part of his endeavor has to do less with the relation of his entire fleet to the enemy than with the relation of his individual ships to each other. And while it is clearly true that he must consider his whole fleet as a unit, it should not be forgotten that no commander-in-chief will probably ever have a fleet made up of units so perfectly homogeneous, that he can allow himself to neglect the peculiarities of

individual ships. And, even if he could do so at the beginning of the fight, it is sure that he could not do so after ships here and there had begun to get injured and disabled, both in his own fleet and in the enemy's fleet. Here will be room for admiralship of the highest order. How shall he strengthen his line, where it is beginning to waver? Shall he stop his column, because the Kearsarge is disabled; or shall he leave her, or shall he send the Kentucky to her aid, or shall he send a flotilla of torpedo-boats? What formation shall he direct, if about to be flanked or *T*'d; shall he change front or charge through the enemy's column, or try to ram? Shall he try to fight at long range or at short range? Shall he concentrate on individual ships, or allow each ship to fire at her opposite? Shall he use ahead fire, or beam fire or bow fire? Shall he dare to retreat a moment, if he thinks it would be wise; or shall he refrain, lest he be court-martialed afterwards for cowardice?

Although the commander-in-chief will have many formations at his command, in which to advance, retreat or jockey, there are only two in which he can fight with full battery power, and these are column and echelon, or line of bearing; and only one in which the gun, ram and torpedo can act together, and this is line.

Column is, of course, the easiest formation, and the one in which the most guns can be used. It has the disadvantages that the ships are helpless against the ram, unless they turn, and thereby destroy the column; and that, if the enemy be abeam, as it probably would be if the fleet were in column, each ship exposes the maximum length of water-line to the gun-fire and the maximum target to torpedo-fire. Now, if any ship in a column gets hit by a torpedo, or by a twelve-inch capped projectile at her water-line, her injury will probably affect not only herself, but the entire fleet; because the entire fleet will either have to abandon her, or slow down for her, or detach other ships to help her. In other words, a serious injury to the water-line of any ship, while it may not injure the offensive power of that ship so much as would the hitting of one of her turrets, may damage the whole fleet more than would the entire destruction of two of her turrets.

Echelon has the advantages that the guns and torpedoes can be fired nearly as effectively as if the fleet were in column, and that the fleet can, at the same time, close in or withdraw. For the sake of brevity, which is necessary in an article so short that attempts so much, echelon is here intended to mean any formation

in which the ships are not in either line or column, but are on a line of bearing different from the course that they are heading. The main disadvantage of this formation is the difficulty of maintaining it; but it is clear that this trouble can be overcome by the simple expedients of practicing it, of taking careful note of compass deviations, of taking careful note of any changes in the speed curves, and of regulating the engine speeds to the necessary fraction of a revolution per minute.

The ideal fighting formation would be line, because the advance is in the direction of fire, and gun, ram and torpedo all can be used; were it not for the presentation of the long horizontal target of thin decks along the line of the enemy's fire; for the fact, at least in our service, that the ships do not have much fire ahead; and for the additional fact that the movement of the ships, if it be not directed at the enemy, gives the enemy a chance to flank; while if it be directed at the enemy, it will be apt to precipitate a mêlée, in which, both fleets having got close together, their guns, rams and torpedoes will combine in an indiscriminate slaughter of everybody.

If both fleets are nearly matched in speed and manageability and in the personal skill of the commander-in-chief, it would seem probable that neither fleet will be able to get a distinct advantage over the other in position. This being the case, and it being also the case that both commanders will recognize the loss in gun-hits that would follow every change of formation, or even turning of a ship, it seems probable that both fleets may "line up" in parallel columns, head to sea, just outside of effective torpedo range, and steam ahead as fast as they can; and that each commander will approach or withdraw, as seems best to him, from time to time, by changing the course very slightly towards the enemy, or away from him, but not the line of bearing.

As this operation, if gently done, will not interfere perceptibly with the gun-fire, and yet will give perfect opportunity for gradual advance, or retreat, and as it is a very difficult thing to do, even on drill, and with the officer of the deck on the bridge where he can see everything; and as the officer of the deck could not stay long there in battle, we see that *our battle-fleet should practice thoroughly at steaming in this formation, with the same officer controlling the ship who would control her in a fleet battle, and occupying the same place that he would occupy in a fleet battle.*

There is only one way in which to get ready for any performance; and that is to rehearse it before hand, under conditions as nearly as possible like those under which the performance will eventually be given.

It may be pointed out here that the range and speed of the torpedo are about to be increased enormously. And, as it will be possible for nations to keep secret what they are doing in this way, there will be interjected into naval tactics a new complication, caused by lack of knowledge by an admiral as to how far he must keep away from the enemy, in order to be beyond his torpedo range. This factor is sure to become very important in time.

(3) In order to put his fleet into such formations as to present the least possible effective target to the gun-fire and torpedo-fire of the enemy, it is clear that the commander-in-chief must refrain, so far as the desirability of attempting to get certain advantages will permit, from presenting the whole length of the water-line of his ships to the gun- and torpedo-fire of the enemy; and especially must avoid disposing his ships in such a way that a shell or torpedo fired at one ship will have a good chance of hitting some other ship.

Admiralship.—As the opposing commander-in-chief will try to force him into positions which he ought to avoid; and as such endeavors, if skillfully made, will not be apparent to an unskilled person until too late, we can easily see how wary and keen our admiral must be, not easily deceived by any feint; how well he must know every move on the ocean chess board; how familiar to him must be the peculiarities of every ship and every captain, not only in his own fleet, but, if possible, in the enemy's fleet; how he must *think* in fleets, and guns, and torpedoes, and turning circles, and range, and coal, and ammunition, and wind, and sea; in order that all mental operations involving them will be quick and sure; in order that he may handle his fleet with the same degree of quickness and accuracy as that which each gun-captain handles his gun.

Concentration and Isolation.—If one of the hostile fleets is concentrated and has an offensive power that can be called 1000; while the other fleet is in two parts of 500 each; and if the large force concentrate on one of the small forces and isolates it, Table I shows that, under the conditions named in Table I, it will have 841 left when the first small force is reduced to zero, and will

have 841 ready to engage the other force of 500. But if it does not isolate one, but simply concentrates on one, while both fire at him, the result will be as indicated in Table V; showing that the aggregate of the values of the smaller forces will always remain equal to the larger force in this case, and that there is no advantage in concentration alone.

We may accept it as a principle there, that *concentration without isolation is nil.*

Attention is here invited to Table VI.

Undeveloped State of Naval Tactics.—A little reflection may lead us to believe that our ships which have been built, and which are building now, are such that they can be used pretty well to carry out any probable scheme of tactics. Many officers think that armored cruisers, as at present constructed, are not worth much, and that the changes back and forth in our ideas about battleships show that our policy has not rested on strategical principles, but on the personal "opinions" of men who have happened to come into power from time to time. This matter will be referred to again; but meantime it can be stated with truth that most officers believe that our ships, as merely ships, are very good; that the constructors and engineers have done their part well. If it be assumed that the ships, as ships, are good, we may inquire whether we have given sufficient study to the question of handling them in fleets; whether we have given sufficient study to what may be called "*admiralship.*"

One could write a long book, and it would be a very interesting one, on the requirements of the officer who will handle our battle-fleet in the war that is to be. Even a brief abstract of such a book cannot be attempted here; though the rough sketch just given of two hostile fleets in each other's presence on the sea must suggest, not only that the infinity of possible situations and changes give opportunity for very great skill in admiralship, and that no more sublime field for exercising skill can be opened up to mortal man; but that, if we are to whip in our fleet fight, and not be whipped, we must develop admiralship to its highest attainable point.

Now there is no such word as "admiralship." There is such a word as "seamanship," and we hear it often in the navy. There is also such a word as "generalship;" and no word in the English language conveys a nobler thought; no word expresses a higher idea of the power a single man can wield. Surely no thoughtful

TABLE V.

	A concentrates on B; B and C fire on A, until B is destroyed. A then fires at C. B and C fire at A.	A distributes his fire on B and C equally. B and C fire at A.
Value of offensive power at beginning.....	A 1000 B 500 } 1000 C 500 }	A 1000 B 500 } 1000 C 500 }
Damage done in 1st period by.....	A 100 B 50 } 100 C 50 }	A { To B 50 } 100 " C 50 } B 50 } 100 C 50 }
Value of offensive power at end 1st period..	A 900 B 400 } 900 C 500 }	A 900 B 450 } 900 C 450 }
Damage done in 2d period by.....	A 90 B 40 } 90 C 50 }	A { To B 45 } 90 " C 45 } B 45 } 90 C 45 }
Value of offensive power at end 2d period..	A 810 B 310 } 810 C 500 }	A 810 B 405 } 810 C 405 }
Damage done in 3d period by.....	A 81 B 31 } 81 C 50 }	A { To B 40.5 } 81 " C 40.5 } B 40.5 } 81 C 40.5 }
Value of offensive power at end of 3d period.	A 729 B 229 } 729 C 500 }	A 729 B 364.5 } 729 C 364.5 }
Damage done in 4th period by.....	A 73 B 23 } 73 C 50 }	A { To B 36.5 } 73 " C 36.5 } B 36.5 } 73 C 36.5 }
Value of offensive power end 4th period....	A 656 B 156 } 656 C 500 }	A 656 B 328 } 656 C 328 }
Damage done in 5th period by.....	A 66 B 16 } 66 C 50 }	A { To B 33 } 66 " C 33 } B 33 } 66 C 33 }
Value of offensive power end of 5th period..	A 590 B 90 } 590 C 500 }	A 590 B 295 } 590 C 295 }
Damage done in 6th period by.....	A 59 B 29 } 59 C 30 }	A { To B 29 } 59 " C 30 } B 29 } 59 C 30 }
Value of offensive power end 6th period....	A 531 B 31 } 531 C 500 }	A 531 B 266 } 531 C 265 }
Damage done in 7th period by.....	A { To B 31 " C 22 B 3 } 53 C 50 }	A { To B 26 } 53 " C 27 } B 26 } 53 C 27 }
Value of offensive power end 7th period....	A 478 B ... C 478 } 478	A 478 B 240 } 478 C 238 }

TABLE V.—Continued.

		A concentrates on B; B and C fire on A, until B is destroyed. A then fires at C. B and C fire at A.	A distributes his fire on B and C equally. B and C fire at A.
Damage done in 8th period by	A	48	To B 24 | 48 " C 24
	B	.. | 48	24 | 48
	C		
Value of offensive power end 8th period	A	430	430
	B	.. | 430	216 | 430
	C		214
Damage done in 9th period by	A	43	To B 21 | 43 " C 22
	B	.. | 43	21 | 43
	C		22
Value offensive power end 9th period	A	387	387
	B	.. | 387	195 | 387
	C		192
Damage done in 10th period by	A	38	To B 19 | 38 " C 19
	B	.. | 38	19 | 38
	C		19
Value offensive power end 10th period	A	349	349
	B	.. | 349	176 | 349
	C		173
Damage done in 11th period by	A	35	To B 18 | 35 " C 17
	B	.. | 35	18 | 35
	C		17
Value offensive power end 11th period	A	314	314
	B	.. | 314	158 | 314
	C		156
Damage done in 12th period by	A	31	To B 16 | 31 " C 15
	B	.. | 31	16 | 31
	C		15
Value offensive power end 12th period	A	283	283
	B	.. | 283	142 | 283
	C	etc.	141

officer can feel that the admiral who will command our fleet in war will have less need for skill in fleet handling than a general has for skill in army handling, or that fleet handling is easier than army handling. And while one may feel that the essential qualities and principles of admiralship are the same as those of generalship, he will recognize the fact that the conditions of handling fleets are so different from the conditions of handling armies, that the science and the art of admiralship must be developed as entirely distinct from generalship; just as distinct as they are from seamanship.

TABLE VI.

This is a continuation of Table I. It represents what would happen if a force of *1000* should fight *separately* two forces, one of *800* and the other of *200*. In the first column, A is suposed to have engaged the *200* force first and to engage the *800* afterwards, beginning with a force of *970*. In the second column, A is supposed to have engaged the *800* force first, and then to engage the *200* with the force left of *569*. This table indicates that it makes no difference which force A engages first.

Value offensive power beginning.....	A	970	569
	B	800	200
Damage done in 1st period by.....	A	97	57
	B	80	20
Value offensive power end 1st period.....	A	800	549
	B	703	143
Damage done in 2d period by.....	A	89	55
	B	70	14
Value of offensive power end 2d period...	A	820	535
	B	614	88
Damage done in 3d period.....	A	82	54
	B	61	9
Value of offensive power end 3d period...	A	759	526
	B	532	32
Damage done in 4th period by.....	A	76	32
	B	53	3
Value of offensive force end 4th period...	A	706	323
	B	456	0
Damage done in 5th period.....	A	71	...
	B	46	...
Value of offensive power end 5th period..	A	660	...
	B	385	...
Damage done in 6th period by.....	A	66	...
	B	39	...
Value of offensive power end 6th period..	A	621	...
	B	319	...
Damage done in 7th period by.....	A	62	...
	B	32	...
Value offensive power end 7th period....	A	589	...
	B	257	...
Damage done in 8th period by.....	A	59	...
	B	26	...
Value offensive power end 8th period....	A	563	...
	B	198	...
Damage done in 9th period by.....	A	56	...
	B	20	...
Value offensive power end 9th period....	A	543	...
	B	142	...
Damage done in 10th period by.....	A	54	...
	B	14	...
Value offensive power end 10th period...	A	529	...
	B	88	...
Damage done in 11th period by.....	A	53	...
	B	9	...
Value offensive power end 12th period...	A	520	...
	B	35	...
Damage done in 12th period by.....	A	35	...
	B	3	...
Value offensive power end 12th period...	A	517	...
	B	0	...

When one considers the enormous amount of literature that exists on the subject of military tactics, and compares it with the meager lot of literature on the subject of naval tactics; and when he contrasts the assured position that the principles of military tactics enjoy with the vagueness within which the principles of naval tactics seem to exist, the feeling must come to his mind that the science of naval tactics is in its infancy. And when he compares the vast mimic battles undertaken to practice armies in war, with the relatively pitiful little drills and search problems in which fleets engage, he must feel that the art of naval tactics has hardly yet been born. The comparison is nowhere clearer than in the way in which military men protect the general, compared with the way in which naval men expose the admiral. Military men recognize the fact that it would be absolutely impossible to replace a disabled general in battle without tremendous loss; that he, and only he, has the battle in hand; consequently they put the general in a place of comparative safety, from which he can exercise control of his forces as a whole. But naval men put the ship of the commander-in-chief and all his staff in the place where it has the maximum chance of being disabled and left, helpless and useless, behind the rest of the fleet, which must continue to advance, or be flanked.

Reasons for the Present Undeveloped State of Naval Tactics.—The reasons why the development of naval tactics has lagged so far behind the development of military tactics are not hard to find. A short reflection shows us that they are:

(1) The fact that the conditions of warfare on the land have changed very much less than the conditions of warfare on the sea. The principal factors in warfare on the land are the ground, the men and the weapons; of these, the ground and the men have remained the same, and the weapons have not changed very much. The principal factors in warfare on the sea are the water, the men and the weapons; of these the water and the men have remained the same; but the weapons have changed so much and so fast, and continue to change so much and so fast, that naval tactics have not, thus far, been changed nimbly enough to keep up with them.

(2) Military tactics are so much more easily understood by civilians than are naval tactics, that military tactics have been assisted more in their development by men not soldiers than have naval tactics by men not sailors.

(3) Both military tactics and naval tactics need, for their systematic development, a good deal of writing; because, at the present day, no art can be developed without the co-working of many people. And writers on military tactics, being for the most part together on the land, have better facilities for formulating their systems than have writers on naval tactics, who have to be, for the most part, widely separated on the sea.

(4) The mental work required of army officers in the exercise of their ordinary duties is so much less than that required of naval officers in the exercise of their ordinary duties, that they have more time and energy left for the study of tactics. The duties of army officers below the rank of brigadier-general are very simple; so simple that they have often been exercised with splendid skill by men of very little military training, or even common education. But the duties of naval officers, of even the earliest ranks, call into constant exercise mental activity of the most rigorous kinds, involving often momentous results.

(5) In most navies, and especially in our navy, the responsibilities of an officer are mostly limited to one part of one ship, until he reaches command rank. In our navy, command rank is attained, on the average, at about the age of fifty-one. Up to this time, the officer's responsibility is fully occupied with questions minor in general importance to tactics, but not minor in importance to him personally; because his personal responsibility, and even his life, are concerned in them. Between the ages of fifty-one and sixty-two, the responsibilities of an officer are usually limited to one ship, unless he is promoted to flag rank. This rank, if attained at all, is attained at about the age of sixty; so that between the ages of fifty-one and sixty, the responsibilities of most officers are limited to one ship. Since officers of our service retire at the age of sixty-two, we know that only from the age of sixty to the age of sixty-two, if ever, shall we have any responsibility connected with naval tactics, except in managing one ship in obedience to signal. Now, we all know that the admirable automatic mechanism put inside every human being by nature may be relied on to regulate his life in ways where his own responsibility and safety are concerned; but that it does not make him do much work, either physical or mental, that does not have some close relation to his own personal life.

(6) In the case of the American navy, the ships and methods

were allowed after the Civil War, not merely to cease to keep up with the advance of civilization in other arts, but actually to revert to more ancient conditions still. The result was that, when reconstruction began in 1881, we were so far behind, that we have not even yet succeeded in getting our ships to equal those of nations who always kept up in naval matters; and the changes in ships and mechanisms have been so rapid and tremendous, that officers, especially officers of the flag rank and command rank, whose professional education was almost wholly confined to sails and spars, have had all they could do to learn to manage the ships and their mechanisms, and have had to leave the larger, but less urgent, questions of naval tactics to those who should come after. And let this not be laid to their discredit. The elaborate scientific mechanisms of a battleship may seem easy to learn to the young officer educated specially and directly for it by the Naval Academy; but he cannot even imagine the efforts that have had to be put forth to master them by officers, already mature, whose minds at the receptive age were filled with sails and spars, and whose total education in electricity was comprised in a few chapters on frictional machines, the voltaic cell and the Leyden jar.

(7) But the main reason, the all-sufficient reason, why there is almost no such thing as naval tactics, is the persistence of the idea, which comes from barbarous times, that the commander-in-chief should be on the fighting line. Armies got rid of this idea long ago. In barbarous times, a general used to lead a charge or an assault; but, even then, when the direction of large forces was required, custom put the general where he could exercise the functions of a general, and direct. Why do not we put the admiral where he can exercise the functions of an admiral and direct, or at least, see? Armies have had ten thousand times as much experience in fighting as navies; why cannot navies learn from them? There is absolutely no use in trying to learn how to direct a fleet in battle so long as the admiral is put where he cannot possibly direct. Farragut had to be lashed aloft, in order to direct. *Yet, in forty years, we have drawn no lesson from this well-known fact.* And there is no difficulty whatever in putting the admiral where he can direct. We have simply to give him a ship like the Colorado, made into a proper flagship by the simple plan of putting into her lofty signal masts and observing stations, and securing on her water-line a belt of twelve-inch armor. The

weight can be made permissible by taking off the six-inch guns and side armor. The expense will be considerable; but this expense ought not to be charged against this beneficent change, but against the original plan of the ship, which made the change necessary.

It may be argued that our forefathers got along very well with the flagship on the battle line. True; but they got along very well without the sewing machine or the telephone.

Development of a System of Tactics.—If this is to be carried out successfully, it is clear that the problem of how to carry it out must be attacked as a definite thing; on the principle that it is really *the* naval problem, par excellence, and that all details of drill and discipline must be directed to carrying it out; not that it shall be directed by details of drill and discipline. Without any intention of criticising the policy that has directed the navy until recent years, and recognizing fully the enormous work that had to be done in building up the "new navy," it does seem that, in many ways, our policy has been shaped along the line of the least resistance, and has been made to conform to old ideas of drill and discipline, instead of modifying old ideas to conform to it. In Germany and Japan, on the contrary, the "new navy" started on broad principles that had been proved to be good, and was really *new;* old customs and ideas that were not of practical use, were ignored, and the "new navy" went ahead unfettered. In the British navy, there has never been any dividing line between the old navy and the new navy; because the British navy was always kept moving along a healthy line of progress, and ships and ideas that had become obsolete were replaced continually by ships and ideas that were not obsolete. But even in the British navy, there has been a continual warfare between the conservative and the progressive men; and a very healthy effect it has had, in preventing the bad effects of extremism on both sides. But the British navy has, nevertheless, been handicapped by obsolete things; and it is, in this way, at a disadvantage with the navies of Germany and Japan, who were able to start fresh with everything new. In our navy, we have been just as much handicapped by tradition and custom as the British navy; and our predecessors in office, assisted by Congress, after the Civil War and until 1881, let the navy get into such a miserable state, not only in ships and guns, but in professional aims and standards, that we have had a

hard time to breathe into its nostrils the breath of life. This idea is not presented with the wish of criticising the motives, or spirit, or patriotism of the gallant officers who fought and suffered in our Civil War; but to lead up to the declaration, which is made here in all sincerity, that the main reason for all our backwardness has been too great a leaning on the past, *too great* a respect for "the traditions of the service." Now, let not this sentence be interpreted as showing a lack of due respect and love for "the traditions of the service," or as recommending that we be no longer influenced by them. There is a glamour about them that enthralls; and they come to us laden with the romantic associations which gathered about our boyish enthusiasms, when we read of Decatur and John Paul Jones; and it will be bad for the country when they cease to fill us with dreams of glory. But the trouble is to separate the traditions which have lived because officers love noble deeds, from the traditions which have lived because they have been too conservative and resisted change too much. Is it not to be expected that we, of a country of eighty million people, the richest and grandest in the world, whose system of government, whose machinery, whose inventions are the greatest the world has ever seen, should have a navy that truly is on a level with this greatness? Now is our navy on a level with our machinery, or our statesmanship, or our wealth? If not, whose fault is it? Of course, the fault lies directly with Congress, because Congress would not give us proper appropriations. But was it not with naval officers primarily? The Phenix, in June, 1809, went under her own steam from New York to Philadelphia, by sea. The Fulton the First, with thick wooden armor and many valuable new appliances, went from New York to Sandy Hook under steam in 1815. Soon after the war ended. Did naval officers say to Congress "this is the kind of ships we need to fight with?" No; they concluded that, because the war was over, there was no longer need of such a ship! Such an account, startling as it is, is nevertheless true. But worse was to follow. In the War of the Rebellion, not a single action was fought under sails, and only one action of moment was a duel; all the important actions were fought by fleets under steam. At the end of the war, did naval officers say to Congress, "we need steam ships, and large fleets, and plenty of armor?" No! The navy returned to the sailing ships of John Paul Jones, and sent

them, singly, on lonesome cruises all over the world, following "the traditions of the service."

It is clear that there are three important ways in which we have already broken away from too rigid an adherence to "the traditions of the service:"

(1) We have broken away from obsolete types of ships and guns, and have in use new types of ships and guns that are fitted, in a measure, to fight against the ships and guns of probable enemies.

(2) We have an improved morâle: a spirit in officers, in men, that takes an interest in the service as a living thing; a spirit that makes officers and men take pride in their ships and guns, and feel the brotherly spirit which always exists among men who are working together to a common end; a spirit that recognizes the fact that, barring occasional lapses, nearly every officer and man in the service, no matter what his station, really wants to do his duty well. This improved morâle is largely due to—

(3) The healthy and exciting emulation in gunnery brought about by Sims, supported by the President, and the amazing practical improvement that has resulted.

But, has our system of tactics improved as much as our ships, guns, morâle and gunnery? It is not necessary to answer this question aloud; but let each officer who can remember a time so long ago, recall the fleet maneuvers under Admiral Luce in 1889, and compare them with those of the present time; let him compare the signal books used then and now, and answer the question, very quietly, to himself.

There may be some officers who think that our system of tactics has not improved so much as these other things. Assuming, for the sake of the interest of the subject, that they are right, the question comes up at once, how shall we improve it?

Having had so recent and startling an instance of improvement as our improvement in target practice, the answer at once suggests itself that, because Sims improved our target practice by concentrating our energies on it, perhaps we can develop a system of naval tactics by concentrating our energies on it.

Assuming that we are to concentrate our energies on the development of a system of naval tactics, it would seem that the things to do are to:

(1) Form the battle-fleet.

(2) Organize it into sections, divisions and squadrons, with appropriate auxiliaries.

(3) Drill it—first, as individual ships; second, in sections; third, in divisions; fourth, in squadrons; fifth, as a unit fleet.

It is plain that 1 and 2 can easily be done, because the only thing needed is an executive order. But in order to carry out 3 wisely, many obstacles must be overcome. The most difficult obstacles, perhaps, are:

(a) The long intervals during which battleships are kept in navy yards for repairs, during which intervals officers and men get out of practice.

(b) The fact that some ships begin to show defects in boilers, engines, or other mechanisms, after being a few weeks away from the yard; thus handicapping the entire fleet.

(c) The difficulty of keeping up the interest of officers and men in any mere drill, combined with the fact that no good scheme of naval tactics can be developed without their interest.

These difficulties seem very big; but it may be pointed out that the great ocean liners go regularly across the ocean, year after year; and that, if we could find out how they do it, we might entirely avoid obstacles (a) and (b). Now, every one knows that these liners *make repairs at the end of every trip*. The thought suggests itself, "suppose that we used our battleships as hard as possible for one week, then repaired them for two weeks; then used them for another week, and repaired them for two weeks, and so forth. Could we not keep them always in repair, always ready, for ten years continuously?" Of course we could. Then why not do it?

A ready answer would be that such a plan would be "impracticable." Perhaps it would, unless we determined to carry it out; but then it would not be. The principal difficulty would be in providing that the ships should always be near enough to repair shops to get needed repairs done at once. By keeping our battle-fleet always on our Atlantic coast, by having it always anchor at the end of its week's work off places like Tompkinsville, and by having a repair ship for every squadron, it should never be too far from a repair shop to get what repairs it might need; for the reason that nothing would ever be allowed to get so badly out of repair as to need actually going alongside a navy yard dock, barring accidents. The ships could take turns going into dry-

dock. And if they went into drydock regularly every six months, and did not lie at anchor in tropical waters, but kept moving in waters of the temperate zone, two weeks, twice a year, would be enough. The causes that lay ships up at navy yards for long intervals are keeping the ships going after they need repairs, and the necessity of limiting the repairs on them, when they finally go to yards, lest they stay there most of the time. The bottom trouble is the former, and it is caused primarily by the long absences from the repair shop.

The idea now struggling for utterance is largely an amplification of that outlined by Lieutenant Fullenwider in his admirable prize essay of 1904; and it would seem not difficult of execution. Without pretending to have worked the idea into practical shape, it may be suggested that the weather near New York during the months of April, May, June, July, August, September, October and November is admirably fitted for fleet maneuvers. In these eight months, the fleet could concentrate for maneuvers at a place about fifty miles southeast of Sandy Hook, clear of the ordinary steamer routes. Here it could drill for five days and five nights at fleet maneuvers of all kinds, including wireless telegraphy with the shore. At the end, the squadrons could disperse; the first squadron of battleships going, say to Tompkinsville, the second to Hampton Roads, the torpedo flotilla to Newport, the cruisers to Boston, the auxiliaries to the mouth of the Delaware, and have two weeks clear for repairs and coaling. On the first of December, the entire fleet could go south, and make Pensacola, New Orleans, Key West, Tortugas and Galveston their home bases, assembling in the Gulf of Mexico for their maneuvers as the war-fleet for five days every three weeks.

Objections may be made that this would neglect the various Caribbean and West Indian ports; but to this objection, it may be replied that the work needed in them can be done by independent cruisers and transports, detailed for the purpose; that our battle-fleet will have all it can do to get into trim as a fighting machine; and that it will be tremendously handicapped if it is to continue to be bothered by little matters in the Caribbean Sea. As pointed out in the beginning of this paper, we have got to recognize the fact that the work of our navy is divided into two parts, that related to weak navies, and that related to strong navies; and we cannot get our battle-fleet ready to fight a strong

navy successfully, if we do not concentrate its effort on that definite purpose.

Coming to the third possible difficulty in developing a scheme of tactics for our war-fleet, that of combining enough drill with a maintenance of interest by officers and men, the suggestion at once comes to the mind that the only thing necessary to do is to have sham battles between the squadrons. The experience of Sims with target practice shows, not only that it is merely necessary to arouse emulation, but that it is very easy to arouse emulation. Officers and men used to hate target practice. Now they like it; and they take that pleased interest in it that everyone takes in a game of skill.

Some years ago, a gentleman, a Jew, who had just returned from a vacation of a year in Europe with his family, was met by a friend. Knowing that he was an active man of large interests, his friend said to him, "Well, Mr. Morgenthaller, I suppose you have come back all ready to get down to hard work again." Mr. Morgenthaller smiled in a thoughtful way, and gave an answer that greatly surprised his friend. "Well, no," he said; "I do not believe in hard work; I believe in good ideas. I'm going to wait for good ideas. One good idea is worth a year of hard work." Mr. Morgenthaller's career since that time has been one of continuing and increasing prosperity. A contrary example comes to mind of another man who has been working very hard all that time, and has been extremely unsuccessful. It is not necessary to describe this case; because everyone who may read these lines can supply like cases from among his own acquaintances.

So, with our fleet, the way to develop a system of tactics is not to "work hard," but to get good ideas. Why not make the fleet work seem like war? Everyone in the world is interested in war. If we fight our squadrons together in sham battles, the stimulus of competition will bring out good ideas automatically. A system of tactics will develop itself; it will simply grow. Every officer will take the joyous interest in the battles that he takes in a game of football or a prize-fight.

And the enlisted men will be interested too; every man will feel that he is immediately concerned, one of the players; that he, Charles Noble, contributes something of his own personal skill and prowess to the result. There is no trouble in making men

work if you can make the work interesting; but you can never make men do the best that is in them at mere drudgery. Now drudgery is not necessarily manual labor; manual labor, even shovelling coal, is not drudgery if the men doing the shovelling are trying to beat some other men, or trying to accomplish anything that they know about; and work of the most refined and artistic kind is drudgery if it is done without interest. *Interest makes the difference, and the only difference, between pleasant occupation and drudgery.*

Now, interest is a powerful factor in making men work; but it is a much more powerful factor in making men think. Who has not noticed that it is easier to teach children things that interest them than things that do not? A man can be compelled to do drudgery; but he cannot be compelled to think. He will, however, think unconsciously, if interested.

How interesting and thought-inducing it would be, if our fleets should be practiced continually in team work, and the practice be of a kind that would show every one exactly what its meaning was! While the carrying out of any maneuver, even of the simplest kind, requires technical skill, the bottom principles of warfare are very simple, and are curiously like those of baseball and football, and other games in which pluck and drill are needed. The most ordinary "rooter" knows which side is playing a baseball game the better, though he may himself be unable to hit a ball, or catch it.

So, if we fight our fleets in mimic fights against each other, every officer, and seaman, and fireman, and ward-room boy will understand enough to become interested. What we need more than anything else is to make our people *interested*. Any one who is interested is very close to being happy. And certainly no profession gives the opportunities for continued interest that ours does. No profession equals it in dramatic situations and picturesque scenes. Yet is there anything more heartbreaking in its dullness than a man-of-war is often made to be!

If, then, it be found practicable to form a battle-fleet and drill it on our coast in the way outlined, we see that the following advantage will result:

(1) A system of naval tactics will be developed at sea; not in an office.

(2) Engines, boilers, and other mechanisms can be kept in constant repair.

(3) Suggestions for improvements in mechanisms and methods can be tested at once, reported on at once, and adopted at once, if good.

(4) Nearly every question of drill, policy, strategy or tactics can be tested and decided correctly, instead of being merely talked about and written about. We shall cease to hear long disputes about the tactical value of speed, because we can actually test the tactical value of speed; or as to how many ships can be handled together, or as to the best formations for attack. We can see all these things tested with our own eyes; and this is necessary, because most of us have not much imagination; we are like the old gentleman in one of Dickens's works, who could not talk about—was it Pip?—unless the child was brought into the room, and put directly in front of him.

(5) The fleet will, after—say a year—of systematic maneuvering, constitute a fighting force that can be handled like a unit.

(6) When it finally goes into battle, not only will the fleet be handled well, but the officers and men will be able to recognize the various phases the action will take on, by identifying them with similar phases that have come up in the sham battles; and will act with preparedness of mind, and therefore with presence of mind.

(7) Officers and men will lead a life of the greatest professional interest.

(8) The greatest disadvantage of naval life, the long and distant absences from home, will, so far as the great majority, the people in the battle-fleet, are concerned, entirely be removed. Instead of interminable months in bad climates, with no mail, and nothing to do or think about, officers and men will be able to have occasional diversion, to be with their wives and sweethearts from time to time, and live like other men.

(9) But the main advantage, the all-sufficient advantage, will be that our battle-fleet will really be *always ready*. There will be no mobilization needed. There will be no sudden question about the Kearsarge's boilers, or the Alabama's forward turret, or the Missouri's engines. There will be no doubt about coal; no need for hasty action; no delay. A telephone message from the Department to the commandant of a certain district, a wireless message from his office, and the fleet will instantly be on a war footing.

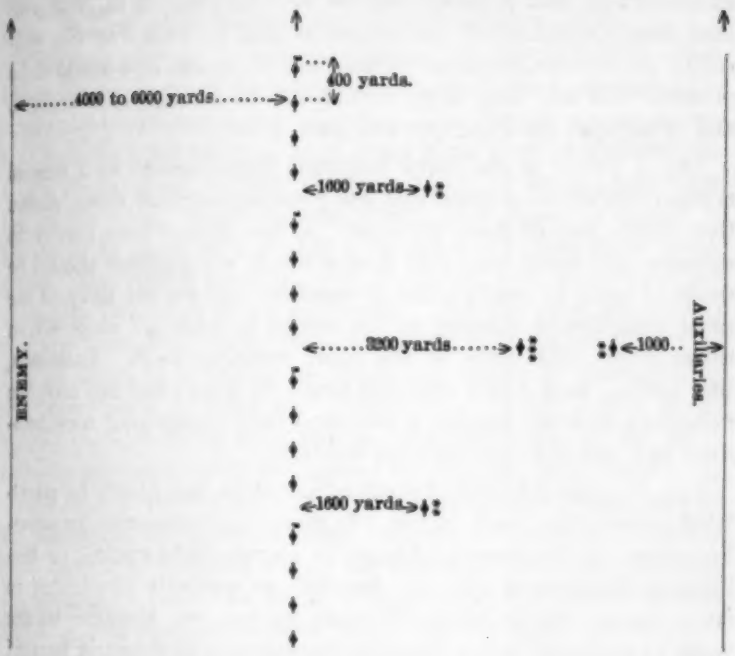
Preparedness of the Commander-in-Chief.—The fleet includes, of course, its commander-in-chief; so that everything said about getting our fleet ready for war includes getting our commander-in-chief ready for war. It is clear that, no matter how thoroughly other things may be decided on, no matter how well the gun-pointers, and quartermasters, and signal corps, and division officers, and navigators, and executive officers, and captains, and division commanders, and squadron commanders, be drilled, all the skill of the subordinates cannot fully be utilized, unless the commander-in-chief be well drilled too. This, of course, does not mean that he shall have been well drilled as a captain, or as a division or a squadron commander; but as the commander-in-chief of the actual fleet that he is to handle. There is no art in the world so simple that one does not need a great deal of practice, in order to be its master; and this means practice at that particular art, not practice at some other art that may be somewhat like it. An officer may be a most admirable captain, or even division commander; but without a great deal of practice in handling a big fleet no man can handle a big fleet well. Only by long application of the mind to a certain problem can thorough mastery of that problem be attained. Even genius of the highest order must obey this law. Perhaps no man ever lived who *seemed* to be so independent of it as Napoleon. But Napoleon was not independent of it; he thought about wars and battles all the time; and his first and most amazing successes in Italy, were in executing plans that he and others had worked out when he was in the Council of War in Paris, two years before. He went to Italy thoroughly prepared; and his marvellous "coup d' œil militaire" was largely due to his intimate knowledge of all the features of the ground, and his recognition of the bearing of each one on the problem. An admiral needs a like acquaintance with his problem, but in a somewhat different way; he does not need the accurate topographical knowledge that a general needs; but, on the other hand, he needs personal skill in the actual handling of his forces even more than a general does, for the reason that ships go faster than men, and events follow each other more quickly; and for the reason that his forces are more directly under his eye, more immediately under his own control than are the forces of a general, which extend for miles beyond his vision.

Loyalty to the Commander-in-Chief.—But there is one element

of success in a commander-in-chief which is a very important one, and which is, in some measure, beyond his own control, and that is the loyalty of the Department and of his subordinates to him. If the Department and his subordinates adopt a critical attitude, if they show a disposition to make him a scape-goat, not only will the commander-in-chief devote a lot of time and brain power to protecting himself from those who ought to be his friends, but his plans for whipping the enemy in front will be complicated by his plans for whipping the enemy behind. How much more efficient will be the commander-in-chief who goes to war knowing everybody will be loyal to him, and that even his mistakes will be looked at calmly. Of course, it is possible that an officer who might do well even in fleet handling during peace, might not do well in fleet handling during war. But we have no real reason for expecting this. The fact that many officers who had little reputation in peace have come to the front in war, is not the proof needed; for the reason that the factors of opportunity, and what we call "chance" aided them, while many excellent officers got no opportunity whatever. If we had data proving that officers who had been efficient in peace had shown cowardice, or disaffection, or inefficiency, in war, the case would be different; but we have no such data. It is true that many officers have lost fine reputations in war, and in many cases, have been thrown into disgrace; but in nearly every instance, in our country, the officer himself was not in fault, but was the victim of excited people who were in fault, and who judged him without sufficient knowledge of the facts. The most notable case was that of Fitz John Porter.

NOTE.—It is frankly admitted that the suggestion regarding the special designing of flagships savors of novelty; and it is also admitted that only a minority of officers believe that the flagship should keep off the fighting line. But why cannot the idea be *tried* in fleet maneuvers? It can do no harm to try it, and it may lead to something. It is absolutely sure that no great improvement, or extension, of naval tactics can be made, so long as the flagships are on the fighting line. One of the first things taught a youthful officer of the deck is that he must not get mixed up with the men on deck. Even a file-closer keeps clear of the ranks. And yet we put the commander-in-chief right in the midst of all the noise, and smoke, and excitement, and danger.

It may be suggested, also, that no matter how strenuously we insist on *beginning* the fight with our flagships on the battle line, the enemy will see to it that they do not stay there very long. By the word "enemy" is meant, of course, the only kind of enemy we need to prepare for; an enemy such that our very *maximum of skill* will be needed to defeat him.



= Flagship of Vice Admiral.

= Flagship of Rear Admiral.

= Division Leader.

ADMINISTRATION OF THE NAVY.

If one should attempt to organize the ships shown in our Navy Register into a battle-fleet, he would be impressed by three important facts:

(1) The excellence of the ships as ships.

(2) Their heterogeneity.

(3) The extraordinary obsoleteness of some, notably of the ships propelled by sails alone, completed so late as 1904.

(1) Our ships are good, of their kind, and they have always been good; and so, in the main, have been the appliances of all sorts on board. The great engineering and constructive genius of the American people has shown itself in their ships; and it is

inconceivable that it should not be so. In view of the magnificent development of all the industrial arts, as shown in our railroads, steamships, business edifices and factories, how could it be possible that our war ships should not be strongly constructed, and fitted with good engines and good guns?

(2) A glance at the Navy Register, supplemented by a mental comparison of some ships that are grouped together there, shows that hardly two of them are alike. It has always been known to military and naval men that forces which act together should be made of units as nearly alike as possible; and yet the navy of the most enlightened country in the world is made of units which differ from each other in the most amazing ways. Railroads, like navies, need a few different kinds of units; but can any one imagine a railroad owning a thousand cars, comprising nine hundred and ninety-seven different kinds?

(3) The obsoleteness of some of our ships can hardly be paralleled in any other walk in life. Is there any locomotive, or printing press, or telephone exchange, or electric-light station, or factory, or department store, or hospital, so perfectly ill-adapted to its work, by reason of obsoleteness, as was the Mohican to the work of the navy, when it was in commission in the early part of 1904; or as the Intrepid, Cumberland and Boxer, now nearing their completion?

The excellence of our ships, as ships, considered in connection with their heterogeneity and the obsoleteness of many; and these facts considered in connection with the additional fact that, within the past two years, the most obsolete ships have been retired, at the same time that three *absolutely new, and yet absolutely obsolete,* ships were approaching completion; and these facts being considered in connection with the additional fact that, only within the last few years has there been any attempt to concentrate our fleet, indicate that our policy has been wavering, uncertain, indefinite and unmilitary. And it suggests the thought that perhaps we have never until recently grasped the military idea; that we have built ships of certain kinds, because other nations did; and have built them in exactly the same way that other nations did; with a good understanding of the mathematical, constructional and engineering principles involved, but with no clear comprehension of those strategical principles by which alone can the

application of mathematical, constructional and engineering principles be directed to the building of good fighting ships.

That this perhaps is true, is indicated by the incredible slowness with which novel appliances and methods were adopted. The most notable instance is that of steam. The Phenix, a river steamboat built by John Stevens, went from New York to Philadelphia under steam alone, by sea, in June, *1808!* Eleven years later, the paddle-wheel steamship Savannah went from Savannah to Liverpool in June, 1819, eighty hours of which were done under steam. She visited many ports in the Baltic, and returned to Savannah in December of the same year. Did the navy see steam's military value, and take immediate steps towards its adoption? No; its slowness in taking up steam can hardly be described by any other word so good as "disgraceful." Many other things equally valuable to the navy had to force themselves on the navy, not only against its will, but against its determined resistance. It would take a very large book—and a most interesting one—to tell about the struggles of these pioneers of progress. Such a book cannot be included within the limits of this paper; but any one can read a substitute for it, by looking up the history of steel for ship construction, sailless ships, turrets, twin-screws, compound engines, rifled guns, breech-loading guns, telescope sights, submarine mines, electric firing of guns, range-finders, rectangular correction of compasses, torpedoes, continuous aim, the Naval Academy, the War College, the Training System, the NAVAL INSTITUTE and the General Staff.

Now why did our naval service, the naval service of *the most inventive, most enterprising, most progressive people who have ever lived* fail to adopt these things quickly? There must have been some very powerful reason, some very definite reason, why anything so extraordinary occurred. It was not because naval officers were more stupid than other men; we know they were not. It was not because they intentionally kept the service back; we know that all their interests were on the side of pushing it ahead. It was not because they could not get the money; we know they did not try. Why was it?

Four reasons suggest themselves:

(1) The naval profession is different radically from all others, in the important fact that the members of all others are gathered together in cities, in such close association, both in personal inter-

course and by means of their periodicals, that the best possible conditions exist for discussion and the interchange of views, and information; whereas we are dispersed all over the world, and spend much of our time in places where, not only is there no mental stimulus, but almost no mental employment, and no chance for interchange of thought; where the narrow limits of the ship and of experience, some times protracted over months, produce an inelastic contraction of the mental view. Many years ago, an old sailmaker said to a midshipman, "Why is it, sir, that, while the army has produced many eminent men, our navy has never produced one master mind?" The midshipman made the astute reply that he did not know; and the old sailmaker went on to say that he thought the reason was that, before an officer got to command a ship, he filled subordinate duties so long that he never learned to think for himself; and that, after he got to command a ship, he had to spend nearly all his time *alone;* so that his mind rusted. At that time, the conversation made no impression on the midshipman that he was conscious of; but it must have made a very great impression, because he has never forgotten it, and has come to regard it in later years as one of the most suggestive remarks he ever heard. And it may help to explain the little influence on public life, which naval officers have, even in their own profession; the fact that the country trusts Congress, not only to decide how many ships we are to have to fight with, but even to decide their technical and military features. It may help to explain why, after the war with Spain, the views of naval officers had almost no weight whatever in deciding what ought to be done in Cuba or the Philippines, though naval officers had had more practical experience in such countries than anybody else.

The fact that naval officers are separated so much and so long from each other and from other men, must tend to lack of unity of purpose, and therefore to lack of influence with the public. The only remedy would seem to be a greater use, by naval officers, of such beneficent means of information as the War College and NAVAL INSTITUTE, and more mingling with men of other professions. It may be objected that we should not go far outside our own profession, lest we lose our grip on it. This is true; but why should naval officers confine themselves more strictly to their own profession than army officers and lawyers do? We lose by doing it. With what astonishing velocity we dropped out of

public sight, as soon as the strictly naval fighting in the war with Spain was finished! The same thing happened, in even greater degree, after our Civil War. The navy's part in the Civil War was important and glorious in the highest degree; and, at the time, was warmly appreciated by the people. Yet no sooner was the war over than the people forgot that naval officers existed. Was it so with the army? Why, the Senate, the House, the Presidential Chair, the Cabinet, the Judiciary, and all the places of influence in the country were alive with generals! Now it may be granted that naval officers do not belong in such places, that we belong out on the ocean. Nevertheless, it does seem that if naval officers, after the Civil War, had kept a little more in touch with the people, and had had a little more concensus of opinion and purpose, our navy would not have become quite so dead as it was in 1882; and we should not have had such a hard time, the last few years, in breathing into its nostrils the breath of life.

What is there in the naval profession, properly considered, that makes it impossible for naval officers to exert the same public influence, in matters connected with their profession, that physicians, lawyers, engineers, architects, clergymen, journalists and diplomats do, in matters connected with their professions? There is nothing; and if proof be wanted, to sustain this assertion, it is the career of Vice-Admiral Lord Charles Beresford. This officer has been member of Parliament twice, and a recognized factor in the national public life of England for many years. He was sent to China in 1898, on a mission connected with the English trade; and he has long been a national figure; a man among men. Do these things make him less efficient as a naval officer? Let us put this question in other words and ask, "Does the contact of Vice-Admiral Beresford with the brightest minds of Great Britain, and the necessity he has so often met of replying to criticisms and questions by thoughtful men concerning the British navy, and the constant activity of mind engendered; do these things make him less efficient than he would have been, if he had spent the time he spent in doing these things, in dozing in tropical ports, in spinning old-time yarns, and in devoting the energies of his mind to matters of detail? These things are what most of us do; we spend too much time in our little shops; we need to be broadened. When we go to clubs we ought to go to clubs where we

can meet lawyers and men of affairs, where we can get a new idea once in a while; not to army and navy clubs.

It is a common belief that, if a man is to do anything well, he must do nothing else well; but one can easily dispel this illusion, by reminding himself that Disraeli was a brilliant novelist, as well as Prime Minister of Great Britain; Gladstone a scholar; Salisbury an experimental scientist; Balfour a metaphysician; Hay a poet; Roosevelt and Thiers historians; Cæsar and Napoleon lawgivers; and Leonardo da Vinci, everything. It may be objected that these men were geniuses, and therefore not to be taken as examples of anything except of genius. Then let any officer recall his last ship; and he will remember that the fact that Jones was a good quartermaster was thought, as a general rule, a good reason for concluding that he would make a good something else; and the fact that Smith was a bad coal-passer was thought a good reason for concluding that he would make a bad something else.

(2) The fact that our system of naval administration has, save in exceptional cases, and until very lately, ignored individuality, and discouraged initiative. When it is recalled that Bell invented the telephone when he was only twenty-nine, and that most of Edison's great inventions were made before he was thirty-three, right in our own country, our policy of avowedly discouraging officers from taking up special subjects in their profession seems hard to understand. The great difficulty of keeping officers in the strait and narrow path of discipline, and of preserving a strong military organization, while giving, at the same time, an opportunity to officers to develop individuality and initiative, if they have any, may be admitted at once. But the most liberal allowance for this difficulty would hardly seem a sufficient reason for the existence of the system in use not many years ago. By this system, not only were an officer's duties at sea regulated exclusively by his position on the Navy Register, where a "first-come, first-served" system put him; but the very fact that he showed an interest and capacity in any branch of his profession operated as a reason for giving him, not only at sea but even on shore, *not* duty in this branch, but duty in some other branch! This system has been abandoned; and the desirability is now seen of encouraging initiative and individuality, so far as it may be practicable. The evil results of the system, however, in removing

from the lives of officers all personal interest in their profession, are still felt, and will be felt for many years to come. The interest of officers in their glorious calling must be guarded as "the immediate jewel of their souls." This can be done only by making them feel like living, thinking men; not cogs in the machinery.

(3) The fact that, saving the case of deeds of extraordinary heroism in life-saving, the special rewards given by the Department to officers have been given only in war. The wisdom of giving special rewards in war is evident. But almost all the officers who have ever been in the American navy have gone through their entire careers without ever seeing any war. Therefore, our system has so arranged matters, that nearly every officer who has ever been in the navy has gone through his entire career, without that special and powerful stimulus which the hope of reward unfailingly gives, and which most men urgently need!

(4) We have never, until lately, employed a body of officers to study the application of strategical requirements to the construction of ships and the composition of fleets; we have never until lately employed a body of officers to study and apply the principles of naval science to the administration of the navy. Individual officers, principally at the War College, have studied naval science; but their conclusions have been so lightly regarded by the service, even the military branch of the service; and the War College has been so much contemned, that military considerations have had, until lately, almost no influence whatever, in shaping the naval policy of the Government. Incredible as it may appear, it seems nevertheless to be a fact, that our naval establishment, enormous as it is, and the guardian of the wealth of the wealthiest country in the world, has simply been put together piecemeal, and has never been directed by a policy based on fundamental principles. It has never had the advantage of such direction as has been given to commercial organizations by men who made a special study of the policy that should direct them; by boards of directors, led by men like Scott, Westinghouse, Rockefeller, Huntington, Carnegie and Cassatt. These men devoted their lives to furthering the aims of their respective companies; and they understood the aims of their companies from a standpoint so far removed from the details, that they were able to direct the details, instead of being directed by them. They

divided their respective companies into departments; but they directed the departments; the departments did not direct them. Had the various departments directed the companies, no one can reason out what would have happened, because no one can find any data to start from; for the reason that such a way of directing a company is unknown. It may be asserted with confidence, however, that a company directed in its operations by its various departments would not be directed with as much unity of purpose as if it were directed by a board of directors, who made a specialty of directing it.

Bureaus or General Staff?—This leads us naturally to inquire whether it would be better to have our navy directed by the bureaus or a general staff; whether, if our navy had been directed by central "Steering Committee," in accordance with the principles of naval science, it would have been directed along lines having such curious side-steps and reversals, as those along which it has drifted in times gone by; or whether it would have gone along a straight, well-planned route, like a piece of material in the works of the New York Shipbuilding Company.

In order to decide whether it would be better to direct the navy by means of some body like a "Board of Directors," "Policy Board," "Steering Committee," "Thinking Committee," or "General Staff," it may be well to consider:

(1) Is it the practice of other countries to direct the navy by a special body, or to direct it by the heads of the various departments?

(2) Is it the practice of other countries, and of ours, to direct the army by a special body, or to direct it by the heads of the various departments?

(3) Is it the practice of large organizations, such as railroads, steamship lines, industrial companies, and banks, to direct the organization by special bodies, or to direct them by the heads of the various departments?

The same answer must be given to all these questions; showing that it is a world-wide policy, in large organizations of every kind, to direct the organizations by special bodies; not by the heads of the various departments.

We see, therefore, that our navy is administered by a policy which is the reverse of that of every other large organization in the world.

It may be objected to this statement that our navy is directed by the Secretary, and that he is the "special body" in the sense in which this phrase has just been used. To answer this objection, it may be sufficient to point out that the Secretary is the assistant and representative of the President; and that the President holds the same relation to the navy as does the President of any organization to that organization. He is the President; not the Board of Directors.

Now if our navy is directed by a policy the reverse of that by which all other large organizations in the world are directed, it follows that, either our policy is right and the policy of all other large organizations is wrong; or else, that our policy is wrong and the policy of all other large organizations is right. As our navy is only one organization, and as the other organizations are numbered by the ten-thousand, it is clear that the burden of proof is on us; and that, in order to prove ourselves right, and all the others wrong, we must prove that our navy has been directed more wisely than the other organizations.

Now, it may be that our navy has been directed more wisely than the Standard Oil Company, or the Bell Telephone Company, or the Pennsylvania Railroad; but it might be difficult to prove it to the Boards of Directors of those companies; especially in view of the fact that our navy existed before they did, and has not progressed so fast.

It may be objected to this mode of reasoning, that it is based on an unjustifiable assumption; the assumption that the conditions under which the United States navy exists are like the conditions under which other great organizations, military and civil, exist. To this objection it may be replied that the conditions seem to be alike, and that no difference has ever been pointed out; also that, when any great departure from standard practice is found, the burden of proof as to the wisdom of the departure rests with the advocates of the departure; not with the advocates of standard practice.

It may also be objected that the application of strategical principles to naval matters is so simple that it does not need special study. To this objection, it may be replied that no subject has ever yet been discovered, so simple that it does not need special study to master it; the very fact that a man thinks a subject simple, is proof that he is ignorant of it.

To this reply, it may be objected that, even if its truth be granted, it may be granted only as a general statement; that, in a practical sense, there are many subjects that do not need special study to master them sufficiently for the purpose in hand. This objection is plausible; but it may be answered in rebuttal, that the only reason why special study of a subject is not needed, is because the results of special study would be *too trivial* to pay for the time and energy consumed.

The gist of the question, therefore, is "would the results of special study of the application of strategical principles to naval matters be too trivial to pay for the time and energy consumed?"

Surely no thoughtful man can believe that the results would be too trivial. And how can he avoid the conclusion that special study is needed *now?* An examination of the ships shown in the Navy Register discloses the fact that, while the officers who built the ships, engines and guns, built them well, according to the mathematical principles of ship construction, engineering and ordnance, the efforts of those officers were not directed aright by the military branch of the profession. Despite the fact that the only important thing to be done was to develop a fleet which could whip any probable enemy in a fleet fight, we find that there is no such fleet; only a heterogeneous collection of vessels, which comprises battleships at one end and sailing ships at the other. Now, if sailing ships are needed, battleships are not; and if battleships are needed, sailing ships are not. No navy that has a definite end in view can possibly need two things so utterly diverse. And it is no small thing to build sailing ships, if we do not need them; they distract our attention, and dilute our purpose; and there is such a tremendous amount of work to do to get our fleet ready to fight, that the attention and purpose of every officer and man must be concentrated on that one thing. Would the attainment of this concentration be *trivial?*

Now, why has our engineering and constructive work been so well done, and yet directed along such wavering lines? Is not some type of battleship the best? Has the progress of invention in the mechanic arts, has the coming of wireless telegraphy, improvements in steel and smokeless powder, necessitated such astonishing reversals of plan as we have followed? Why did we abolish torpedoes from our navy and then re-adopt them? If the superposed turret be good, why did we abandon it; and if it

be bad, why did we go back to it? Why have we built all these armored cruisers, with weak armor and weak guns, in deliberate preference to the same number of battleships? Why have we always been so slow in adopting improvements? The reason is easy to find: we have never, until lately, employed a body of officers to make special study of the real requirements of our navy. Not until lately, have we realized that a navy is useful for one definite purpose, and that purpose purely *military;* not diplomatic, or educational, or philanthropic, or beneficent, or charitable—but military; to exert force, that is all.

Now if it is to exert force, in what way is it to exert force? One might reply that the force it is to exert is mainly moral; that it is a potential force, rather than kinetic; that its usefulness is to maintain peace rather than to prevail in war. But even if this be true, it is obvious that the only way in which it can exert any force is by using, or threatening to use, its *destructive power.*

Now will any one say that to manage any destructive power well is a *trivial* thing? Surely not; and the greater the destructive power is, the more important it is that it be managed well. A little destructive power may perhaps be left to itself in a measure, because it can do little harm; but the destructive power of the American navy will soon be describable by no other word so good as "awful;" and the very best possible system must be devised, so that we can direct it aright.

But is there any urgent need for making the directing of this power a specialty *in time of peace?* Does the directing of the navy need any special organization in time of peace? The ready answer to this question is that whatever reasons make it wise for us to perfect the military organizations of one ship in time of peace, make it wise to perfect the military organization of the navy in time of peace. The pages of history are full of the achievements of great commanders, whose work brought them more of human glory than men in any other walk of life have ever got. And the work of these commanders was wholly in directing military force; not in construction work, or engineering work, or ordnance work; but in exercising a purely military control. Will anybody say that work of such grandeur and importance is not a specialty, does not need a special organization? Surely not. But if this special organization is to be made, when

shall it be made? When war comes it will be too late. Therefore, we must make it in time of peace. We must get our roof ready before it begins to rain, not after. Our history proves that, in actual war, our army and navy have always fought well; but that serious failures have occurred, which were due *wholly* to lack of preparation in time of peace. Our national military vice has always been lack of preparation in peace for war.

Co-Operation of the Military and the Engineering Arts.—It is earnestly to be hoped that what has just been said will not be construed as belittling the art of the constructor or the engineer. It is intended merely to point out that the military art is a specialty, just as much as is the art of naval construction, or mechanical engineering, or ordnance. To get a good navy, the various arts must work together, each directing and assisting the others. In the same way that the State Department may have to modify its desires, at times, by the limitations of military and naval possibilities, so will the military controllers of the navy have to modify their desires at times by the limitations of technical possibilities. The technical arts and sciences are now tremendous in scope, and their greatest achievements are in the construction of ships of war. The scientific construction of ships, ordnance, engines and equipments is just as important as ever; in fact the increasing acceleration in these arts, due to the invention of new methods and appliances, makes the technical arts more and more important every year, even to a military navy. The very highest technical skill is needed; and the proper influence of technical men should not be gainsaid or resisted. But the very fact of the tremendous importance of technical matters is the greatest reason why they should be directed aright, to get the military results we need.

Urgent Need for Action.—Now this is an urgent matter. The Isthmian Canal is begun; the Monroe Doctrine has been asserted; and it has been approved and adopted by the deliberate concensus of the American people. Soon the ships of every nation will throng the waters of the Caribbean and Bay of Panama; soon the people of every country will crowd the shores of the countries of Central and South America, whose governments are weak. Is it absolutely sure that no dispute will arise between some of them; or between a European power and one of them? Will the European powers gladly acquiesce in a wholesale application of the Monroe Doctrine to all cases?

It is very improbable. Now we know that we shall have no trouble in getting brave officers and men to fight; there never has been any trouble, and there never will be. But mere bravery, if directed unwisely, causes mere useless slaughter. All history is full of the horrible experiences of people who tried by bravery to make up for the unwisdom of their superiors; the unfortunate Russians in Manchuria and Port Arthur are trying to do that now.

A definite responsibility rests on every officer, with a weight proportioned to his rank, to think and study about the best policy for our navy, and throw his influence the right way; so that, when war comes, the sacrifices of brave men may not be made in vain. Let us remember that the naval defense of our country is our profession, not that of Congress; and let us study its military features as thoroughly as our constructors have studied its constructional features. No more important duty has ever come to men than will come to us within the next few years. In order to prepare to do it well, the first thing needed is a definite military—or rather naval—policy.

To formulate a policy that will be the best, will clearly need the closest study, the most original suggestion, the most careful thought, and the most logical decision, of a special body of officers.

Need for Executive Authority.—It may be objected that, no matter how able such a body may be, no matter how wise and urgently necessary the policy it may formulate, all its work may be set at naught, either by intention or by negligence, unless some machinery be devised to insure that its recommendations be carried out.

This objection seems good; it seems as if the special body, or general staff, if it is to be of sufficient value to warrant its existence, must have the same authority in its line of work as each chief of bureau does in his line of work, or as the admiral of a fleet does, in his line of work; and for exactly the same reasons.

The chance that such authority, given to a general staff, will lessen the power of the Secretary, is the same as the chance that the authority now given to a bureau chief, or admiral of a fleet, or any officer, seaman, or marine, will lessen the power of the Secretary. No authority given to a subordinate can truly be said to lessen the power of his superior.

But some system, different from the old, is clearly needed *now*. To devise it will require much candid thought and singleness of

motive, especially to those in high position. But there is an example close at hand, to guide and strengthen them; the example of him who, though he attained the highest position a naval officer can attain in peace, was always loved and known as "Harry Taylor."

ADDENDUM.—The writer respectfully requests attention to the fact that news received after this essay was submitted to the Board of Control indicates that his prediction concerning the fate of a flagship on the fighting line in a modern battle was fulfilled with extraordinary completeness, at the naval battle of Port Arthur, on August 10, when the Japanese concentrated their attack on the Russian flagship and speedily disabled it, thereby, and at once, demoralizing the entire Russian fleet.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HONORABLE MENTION.

THE DEPARTMENT OF THE NAVY.

By REAR-ADMIRAL STEPHEN B. LUCE, U. S. N.

Motto: "To improve the stream begin at its source."

The U. S. Naval Institute was established about thirty years ago for the avowed purpose of advancing professional and scientific knowledge in the navy. There can be no doubt that this laudable object has been accomplished, to a great extent, through the disseminating of useful information and by giving publicity to well thought-out plans looking to the betterment of the naval service.

Not the least valuable of the contributions to its pages have been the discussion of questions connected with various phases of naval policy, upon which there have been wide and reasonable differences of opinion. But while the net results have been such as to promote sound public opinion on many of the leading questions at issue, it may well be asked, "What practical good has been accomplished through its means beyond that just stated? Who, in our system, is to consider and, haply adopt, any one of the many good ideas to be found in the pages of PROCEEDINGS?" This question leads directly to another: the consideration of the source, whence all naval policy proceeds, viz.: The Department of the Navy. This is not a new question.

The discussion as to the best form of naval government has been carried on in these pages for some years past, but with indifferent results.

Let us now place the Department, itself, on the stand, and learn, from original sources, what it has to say in its own behalf. To this end we may bring the testimony of some of the dis-

tinguished gentlemen who have presided over the navy during the past few years. They are the most competent judges of the workings of their own office. They can speak with an authority vouchsafed to few, for each Secretary of the Navy in turn runs the Department. By concatenating certain of these expert opinions (not all, indeed, for that would far exceed our limits) we may be enabled, each one for himself, to judge of the true character of the Department, as revealed by itself; of its ability to map out a far-reaching and comprehensive naval policy; of its capabilities for governing and guiding the military operations of the fleet; and of the degree of efficiency and economy secured by this particular form of administration.

First, as to the composition of the Department.

The act of April 30, 1798, which called into existence the Department of the Navy, provided for a Secretary of the Navy, whose duty it was to *execute such orders* as he should receive from the President; for a principal clerk, and for such other clerks as might be thought necessary. Not a very complicated piece of machinery perhaps, but it illustrates the very crude notions of that day relative to naval organization.

To-day we find the Navy Department composed of one Secretary of the Navy, an Assistant Secretary, eight bureaus, a Judge-Advocate General, and a proportionate number of clerks.

About twenty years ago, the Secretary of the Navy, not satisfied with the business methods of our navy yards, propounded the following query: "Whether a given navy yard is fully equipped with the necessary appliances for the prompt and economical execution of such work as may be required; and, if not, what will be required to place it in proper condition for the probable demands of war?"

A portion of the answer of the board of officers to whom the question was addressed is given herewith at length, as it goes to the very root of the matter and shows clearly that the unbusinesslike methods which obtain in our navy yards have their origin in the defects inherent in the Navy Department. The logical conclusion—the conclusion from which one cannot escape—is, as there stated, that reforms in our navy yard methods must begin in the Department itself.

After making certain recommendations, the report of the board continues: "The third query invites an expression of our views

as to whether 'any improvements can be made in the system of performing the work at the navy yards which will promote efficiency and reduce expenses.'"

Answer: "To a proper understanding of the subject, it should be stated, that the present wasteful extravagance in employing so great an excess of non-producers, and the inefficient system of doing business which has for years past been steadily increasing in our navy yards, is but the natural outgrowth of the constitution of the Navy Department itself. There can be no manner of doubt of this. Each navy yard is made up of a number of separate and comparatively independent establishments, little principalities, as it were, each owing allegiance to its own sovereign, the Chief of the Bureau to which it belongs. The heads of departments of a navy yard have extensive and responsible duties, and a large patronage, and are naturally jealous of the interference of any one but their own chiefs.

"Thus each department has been gradually building itself up, so as to be independent of all other departments, and is constantly striving to do all its own work. Each of the principal departments has its own body of artisans, its own machinery, its own steam generators, and its own peculiar method of doing business. As an illustration, we take from official 'schedule of wages' (Form 9) of civil engineer's office the following ratings: Boiler-makers, boiler-makers' helper, caulkers, coopers, cabinet-makers, core-makers, ship-joiners, ship-carpenters, machinists, machinists' helpers, moulders, oakum-pickers, and pattern-makers —a little ship-yard in itself.

"In this way it has come that some of our yards are filled up with machinery far beyond their actual needs, and it is no exaggeration to say that there is to-day enough machinery of various kinds in either the New York or the Boston yard to do the work of its own particular class, of the entire navy, during peace. We habitually speak of a private ship-yard as a 'plant;' but each of our national ship-yards is a segregation of 'plants,' each having its own separate organization and each its own internal regulations. Many illustrations might be given to show how, through the want of concert of action among these several 'plants,' useless and vexatious delays occur, to say nothing of the waste of time and of public money due to such diffusion.

"To make such radical changes as we propose in our memo-

randum was no easy task, nor did we expect that they could be effected without considerable friction, not to say opposition; but supposing the changes to be made on the basis laid down by the Commission, it is hardly to be hoped, that under present conditions they will be permanent. For whatever changes may be introduced now, and howsoever beneficial they may be, still the same causes remaining in active operation must inevitably produce the same result, and in time restore the system of independent plants with all its attendant evils. Hence we conclude that *to organize our navy yards on a just and permanent basis, to consolidate their several plants, to introduce thrift in the management and promptness in the methods of doing the work, with a proper system of accountability; to secure, in short, in each of our yards, unification, method, economy, and dispatch, with an administration of its affairs agreeable to the principles of business as understood in civil life, it is absolutely necessary to begin within the Navy Department itself.*

"Upon the consummation of so desirable an event, which need not necessarily change the general character of the present organization of the Department, the scheme for consolidation, the proper classification of duties, and the abolition of all unnecessary employees in the navy yards can be carried into effect without difficulty and with the essential element of permanency insured."

One copy of this report was sent, by the Secretary of the Navy, to the Senate, under date of January 14, 1884, and one copy to the House of Representatives. It was referred to the respective Committees on Naval Affairs and ordered to be printed. It is clear, therefore, that the members of those committees were fully informed on the subject. It does not appear, however, that it elicited any attention or that the charges it contained have ever been refuted, or a single statement challenged.

On the contrary, during a succeeding administration and one of a different political complexion, the Secretary of the Navy, himself, took up the subject and exposed, with relentless candor, the wasteful extravagance which characterized the business methods of the Navy Department.

"It must be evident that there is something radically wrong with the Department," wrote the Secretary of the Navy, in his annual report to Congress under date of November 30, 1885. And he adds: "The universal dissatisfaction is the conclusive

proof of this." He then proceeds to dissect the bureau system, as it then existed, with merciless precision, and gives to the world a "record of mismanagement, of wasteful expenditure, of injudicious and ill-advised disposition of public moneys," such as should have led to immediate and salutary reforms.

For the seventeen years preceding his administration over seventy-five millions of money had been expended "on the construction, repair, equipment, and ordnance of vessels, which sum, with a very slight exception, has been substantially thrown away."

To illustrate "the follies of the Department" the Secretary cites the case of the Omaha, an old wooden vessel of obsolete type, that was rebuilt at a cost that would have paid for a modern steel ship of the same rating! The curious part of this piece of extravagance was that the responsibility was so diffused over several bureaus that it could not be laid to the door of any one in particular!

In respect to navy yards the extravagant system is fully detailed—"a state of things which," the Secretary adds, "it is almost impossible to correct under the present organization of the Department." These last words, coming as they did from a Secretary of the Navy of marked ability, are significant and fully confirm the views of the board hereinbefore quoted. And, finally, to secure desired results *"a reform in our organization is indispensable."*

Even with such overwhelming evidence of its necessity no reorganization was attempted, but an improvement in the methods of transacting the business of the Department by placing the purchases of the several bureaus under the Paymaster-General was introduced.

The next administration succeeding took up the same question of the organization of the Department. Under date of November 30, 1889, the Secretary laid bare the glaring defects of the bureau system in language so clear and pointed that the wonder is it failed to attract the attention of Congress.

"The details of administering the navy, as an existing force," he reports, "its vessels in commission, its officers and its crews, were scattered, without system or coherence, among a variety of offices, bureaus and boards. The assignment of officers to duty, and, to a limited extent, the movements of ships in commission, were in charge of an 'office of detail,' at the head of which was

the Chief of the Bureau of Navigation, which bureau was, at the same time, supplying compasses, chronometers and navigating instruments, electric-light plants, ship's libraries and other miscellaneous articles." The Secretary then proceeds to show how business is distributed among other bureaus and adds: "To all these fragments of authority there was no central unity of direction except such as could be given by the personal attention of the Secretary, to the exclusion of that broad and general supervision over all executive business which is required by a department as comprehensive as the navy; and cases were not infrequent where a ship received simultaneous orders from three separate bureaus, which were so directly contradictory that it was impossible to execute them."

"To attempt to reach a conclusion by means of three co-ordinate bureaus working independently," remarks the Secretary of the Navy, "without unity of direction, and without any established organization by which differences may be harmonized, and an agreement reached, must produce delay, confusion, changes of plans, and additional expense. To remedy this serious defect, the only plan which the *law admitted* was adopted." This was the origin of the Board of Construction created by General Order No. 372, in 1889.

In 1895 the Secretary still further simplified the business methods of the Navy Department but left the question of reorganization untouched.

But with all this public exposure of the fallacy of bureau methods and with the shameful case of the Omaha as a warning, equally unfortunate were the cases of the Puritan and Terror, monitors, ten years later. The hulls were rebuilt by one bureau, and the worn-out engines and defective boilers were allowed to remain by another bureau; so that in the Spanish War these otherwise fine vessels, with their high military value, could not steam fast enough to "get out of their own way." The warning furnished by the Omaha was disregarded.

The report of the Secretary of the Navy of November, 1903, alludes to the defective organization of his Department in no uncertain terms. He repeats substantially what was said twenty years ago, of eight bureaus working independently of each other. "The distribution of business among bureaus independent of, and unrelated to each other (except through the action of the

Secretary), unquestionably creates a condition out of which grow conflicts of jurisdiction between the bureaus, sometimes injurious, and a tendency to consider the interests of the bureaus rather than the interests of the navy. The division of business in the bureaus . . . . extends to the navy yards, and even to some extent to ships in commission. This leads sometimes to excessive and cumbersome organization, and lack of harmony of effort, resulting from the fact that there is no co-ordination, except by the voluntary action of bureau chiefs, short of the Secretary's office itself." And more to the same effect.

After exposing the defects of the existing state of affairs, the Secretary goes on to make a distinct recommendation looking to an improvement in the constitution of his office. This led to a state of affairs which can hardly find a parallel in the naval history of any country.

The insufficiency of the personnel of the Secretary's own office had long been felt. The necessity to a Secretary, fresh from civil life, of an intimate and confidential relationship with some one officer, or officers, of rank and acknowledged fitness for the position, had been fully acknowledged. This phase of the question was very clearly stated in the report of the Secretary of the Navy in 1885. Moreover, the very large increase in our naval establishment, and correspondingly increased expenditures, together with the greater military value which now attaches to our squadrons, imperatively demand that the office of the Secretary of the Navy should no longer be left without a professional assistant. However well that arrangement may have suited in 1798, it is not practicable now.

The President, recognizing these several considerations, desired that the functions of the general board should be made permanent, under another name, by legislative enactment, and so expressed himself. "It is eminently desirable," he wrote to Congress in December, 1903, "that there should be provided (by Congress) a Naval General Staff." . . . . "We need the establishment, by law, of a body of trained officers who shall exercise a systematic control of the military affairs of the navy, and be authorized advisers of the Secretary concerning it."

This judicious recommendation of the President, ably seconded as it was, by the Secretary of the Navy, met with violent opposition. And while it cannot be said that the President's object was

actually defeated by those upon whose support he had every moral and legal right to count, yet it may be affirmed that such opposition to constituted authority was not an example calculated to improve the *morale* of the naval service. The case is exceedingly valuable, however, as furnishing a good illustration of our peculiar methods of naval administration and the total absence from it of the military character—that very character the President saw was wanting.

Finally, in the last annual report (Nov. 23, 1904), the Secretary reaffirms the views of his predecessor as to the essential points of naval administration as follows:

"The question of the need of a general staff or board to serve the Secretary of the Navy in an advisory capacity was carefully considered by my predecessor. . . . . It is conceded that the upbuilding, preservation, maintenance and efficiency of the navy is to be attained only by unceasing exercise of trained vigilance in all departments, under *intelligent and consistent general supervision*. . . . . It is further considered that when the desired results are attained, and we have a satisfactory aggregation of ships well equipped and manned by a trained body of officers and men, the field for the exercise of wise administration is merely broadened."

If there is any one person besides the Secretary of the Navy, who can speak with authority on this subject it is the Chief of the Bureau of Navigation. Quoting from the Regulations for the Government of the Navy, Section 1, Article 3, defining the duties of his office, he states in his report of October 17, 1904, that the language of the regulations "might seem to indicate that the Bureau of Navigation has cognizance of the making of plans for the preparation of the fleet for war; *but work of such character does not properly come under the cognizance of a bureau, for it comprehends matters pertaining to all bureaus.*"

[We have italicized the last clause in order to call particular attention to the fact that it supports our contention that military functions do not pertain to the civil branch of the Department.] He then reaches the very natural—indeed the inevitable—conclusion that there is needed "an advisory body which shall not be under the control of any bureau, but responsible directly to the Secretary in matters of naval policy."

"Such a board," he continues, "would not encroach upon the

province of any authority now constituted; but, in presenting to the Secretary, in well-digested form, the mature opinions of officers of rank and active experience, would furnish, in such measures as the Secretary might approve, a definite object towards which the several bureaus could shape their plans in matters under their respective cognizance, with efficient and economical co-ordination. This board being a continuous body, its membership changing only a part at a time, would impart continuity as well as sound progress to the policy of the navy, both these qualities being essential to the highest efficiency of a great military organization."

With this last link in the chain of evidence we may rest our case.

Out of its own mouth shall the Department be judged.

Let us now seek the fundamental principle underlying all naval government, and learn how far our system conforms to it. To do this we must turn back to original sources. It is not necessary to refer to the Laws of Oleron. We may begin with the early history of the English navy, wherein will be found the origin of many, if not most, of the "customs and usages of the sea-service most common to our nation."

Our code of naval discipline, for example, commonly known as The Articles of War, was taken bodily from the English code, making such verbal changes only as were necessary to suit the different forms of government. Thus, taking one article at random, the English Articles of War declare that:

"If any officer, mariner, soldier or other person of the fleet, shall give, hold, or entertain intelligence to, or with, any enemy or rebel without leave from the King's Majesty or the lord high admiral, or the commissioners for executing the office of lord high admiral, commander-in-chief," etc., etc., "every such person so offending, and being thereof convicted by the sentence of a court-martial, shall be punished with death." (George III, Regis.)

The corresponding article of the American code runs as follows:

"If any officer whatsoever, mariner, marine, soldier, or other person, belonging to any ship or vessel of war in the service of the United States, shall give, hold, or entertain intelligence to, or with, any enemy or rebel, without leave from the government, commander-in-chief," etc., etc., ... "every such person so offending and being thereof convicted by the sentence of a court-martial, shall be punished with death." (Act approved March 2, 1799.)

Nor was this all. The English colonists of the North American colonies brought with them the English common law, which to-day largely constitutes the system of jurisprudence of this country. The colonial governments were, as a matter of course, altogether English and retained their English characteristics when they were merged into State governments; and the constitutions of the original thirteen States were freely drawn upon in the formation of the Federal Constitution. In brief, the Constitution is, in its essential features, similar to the Constitution of England as it was understood during the reign of George III. Under these conditions it was but natural that, in the early days of the navy, the Secretary of the Navy, finding no naval organization at hand, should turn to England for inspiration. No one can read the naval history of those days without being struck with the fact that in 1812 there was no naval government worthy of the name. It was the period when there was "no law for a post-captain." The War of 1812, however, and the successes achieved on the Lakes, and on the ocean, brought our little navy into public notice and gave it an importance in the eyes of the people it had not till then enjoyed.

Towards the close of the war the Secretary of the Navy, William Jones, appreciating the importance of organizing his department on a sound basis, made an earnest appeal to Congress to enact the necessary law framed on the lines which he himself laid down with much care.

William Jones, of Philadelphia, soldier, sailor, and statesman, was singularly well-equipped by his varied experience for the position of Secretary of the Navy. He had served throughout the Revolutionary War, both in the army and afloat with credit. He was a lieutenant under Captain Thomas Truxtun on board the privateer St. James, 20, during a fierce engagement with an English sloop-of-war in 1781, and was highly commended for his conduct by that celebrated officer. In 1801 we find him serving a term as member of Congress. In January, 1813, he was appointed Secretary of the Navy. With such military and naval training, added to the profound respect with which the naval system of England was regarded by the entire maritime world, it is not to be wondered at that the English form of naval administration strongly appealed to him as a model worthy of adoption.

The English naval administration was the growth of many

generations, and had proved its efficiency by the severest of all tests—long and exhausting wars, spread out over the four quarters of the globe, when the resources of the kingdom had been tried to the penultimate.

During the reign of Charles II, the English were contending with those brave old sea-fighters, the Dutch, for the dominion of the seas. It was at this time that James, the young brother of the King, received, as Duke of York, the appointment of Lord High Admiral; and was given command of the Channel fleet then preparing for battle. He was exceptionally well-qualified for the discharge of the high and responsible duties of the office. He was both soldier and seaman. He had been trained in the school of war on the continent under the celebrated Turenne, and had fought under the great Condé; he had beaten the French in a sea fight; and had gained a great victory over the Dutch Admiral Opdam. He was in every sense a highly capable naval officer; and the English navy owes much to his salutary reforms. As Lord High Admiral he stood for the crown. To him it was only necessary to recognize an abuse in the naval establishment in order to apply the correction; to see the direction of improvement, in order to adopt the measures to secure it. He did not have to refer questions of naval administration to others; he acted upon his own initiative. All power in naval matters was lodged in his hands. He was a naval administrator in reality.

When the politics of the day (the Test Act) demanded his removal, there being no one possessed of the necessary qualifications for filling his place, the office was put in commission, under the title of "The Commissioners for Executing the Office of the Lord High Admiral." It is this form of administration that has governed the navy of England, with a few unimportant exceptions, for over two hundred years.

When the Duke of York succeeded to the throne in 1685, as James II, he assumed the titles of Lord High Admiral and Lord General, and brought his large and varied experience into the management of the navy. Hence it came, as Sir William Blackstone informs us, that the King is considered as the generalissimo, or first in military command, within the kingdom, the statute extending not only to fleets and armies but also to forts and other places of strength within the realm, the governing of which belongs to the King in his capacity of General of the Kingdom. This

prerogative of the kingly office finds its analogue in the President of the United States who, by virtue of his office, is the constitutional Commander-in-Chief of the army and navy.

As the Chief Magistrate, be he King or President, cannot give his exclusive attention to naval affairs, the question resolves itself into the very simple one: Who is to execute the office of Commander-in-Chief of the Navy? Is the power to be vested in one person? Certainly not. The cases are so very rare where the characters of the statesman and of the naval officer are found combined in one person that we must seek some other solution. In brief, the answer was furnished ninety years ago by the Navy Department in recommending what was virtually the placing of the office in commission.

It is clear that his military and naval instincts prompted Secretary Jones to recommend to Congress in his letter of November 15, 1814, the adoption of the English theory of naval government by the appointment of commissioners for executing the office of the Constitutional Commander-in-Chief of the Navy. And that was, in effect, actually accomplished by the act of February 7, 1815, authorizing the appointment, by the President, of three officers not below the rank of post-captain (at that time the highest rank known to the navy), "to act as a Board of Commissioners for the Navy of the United States."

The providing of a competent person, or persons, to execute the office of Commander-in-Chief of a navy is the very essence of a sound naval government. And this, we apprehend, is the last analysis.

When, some twenty-seven years later, the Board of Navy Commissioners was abolished there was no one left to execute the office of Commander-in-Chief of the Navy, and that office still remains in abeyance. Therein lies one great cause of the inefficiency of the Department as a military entity.

It has been shown from a cursory glance at certain of the annual reports of Secretaries of the Navy for the past twenty odd years how each one regards the office from his own point of view. One Secretary desires to effect reform in the business methods of the navy yards; another one corrects the abuses in the matter of making purchases by the different bureaus; and still another deplores the want of harmonious working among the several bureaus. Each succeeding Secretary has, in turn, introduced cer-

tain reforms. But the functions of the Secretary, himself, as the President's executive, and the necessity for making some provision for that part of the business of the Department, has not received the attention its great importance demands until quite recently.

The title of Commander-in-Chief of the Navy carries with it the idea of military command. Hence the exponent or agent of that office, or let us say those who "execute the office," as the phrase goes, should hold, in combination the political and professional qualifications necessary to the discharge of the duties.

That Secretary Jones fully understood the military character of the Navy Department is indicated by his letter to the Senate in 1814, already referred to. He sharply and very justly criticises the civil administration of the English navy, which was then in a deplorable condition; and adds that "it is but just to observe that the organization of the military part of their system is much more perfect." After alluding to the necessity for a revision of the civil administration of our naval affairs, he remarks that "*the executive branch should be conducted by persons of enlarged views, collectively combining all the practical knowledge and professional intelligence which these important, diversified and comprehensive subjects require.*"

His scheme may be tabulated as follows:

THE PRESIDENT.
(Commander-in-Chief of the Navy).
SECRETARY OF THE NAVY.

Executive or Military Branch.	Civil Branch.
Three Commissioners (Naval Officers of Rank).	Finance. Materiel.

Congress adopted one part of the Secretary's plan; but was silent as to the other part. It provided for the military branch in the three navy commissioners by the act of February 7, 1815, but omitted to provide for offices of Finance and Materiel. Herein it failed lamentably.[1] Twenty-seven years later, 1842, Congress

[1] Congress authorized a Board of Admiralty, October 28, 1779, consisting of three commissioners and two members of Congress, but it was very short-lived.

went to the other extreme, and while providing for the civil administration of the Department by giving it five bureaus (subsequently increased to eight), reduced the executive branch to a minimum. This is another very grave defect in our naval organization.

It may help us to a better understanding of the subject under consideration if we examine the theory on which the Department is constituted and show how it might be interpreted by a strict constructionist.

Should the President determine to send a naval armament to a given point for the protection of American interests, who is to execute the order? The answer is that the order would be carried into effect by the executive branch of the Department. Of what does the executive branch consist? Of a civilian Secretary of the Navy. What has a Secretary of the Navy told Congress of his own functions in this respect? Answer: "The Secretary may at once be eliminated from the problem." Who, then, is left to execute the President's order? Nobody. From this we are led to conclude that there is no naval executive in the Department. The Navy Department is composed mainly of the civil administration of *Finance* and *Materiel*, with limited executive power. It is mainly an industrial establishment.

Let us quote for our further instruction, the entire passage from which the above startling declaration, as to the status of a Secretary of the Navy, is taken.

Referring to the act of 1842 establishing the bureaus, the Secretary informed Congress that "it was supposed at the time of the passing of the act that the bureau chiefs would be able to sit in consultation with the Secretary, and the Department would not lack intelligent guidance. But the inevitable result of throwing large executive duties upon any man is to disqualify him for council. At the present time this function is not performed at all. *The Secretary may at once be eliminated from the problem.* A civilian, ordinarily, not skilled in the art of war, nor having the technical knowledge with reference to its implements, having no personal staff, his separate office force consisting, as estimated for and appropriated by Congress, of but one stenographer, one clerk and three messengers—all the other force having the general clerical work. Thus it happens, as it has happened for the last twenty years, that the Department drifts along doing without con-

sideration whatever is done, and with no intelligent guidance in any direction." And he adds "no power is lodged with the Secretary to make any effectual changes in the organization of the Department itself, or to do more than redistribute somewhat the functions among existing bureau chiefs." (Report of Secretary of the Navy, November 30, 1885, pages XXXVIII and XL.) This is a pretty severe arraignment. Written nineteen years ago these strictures upon our system of administration are, notwithstanding the partial reforms effected from time to time, in a great measure applicable to-day. The proof of this is to be found in the annual report of November, 1903, already quoted.

We are not ignorant of the various expedients this condition of affairs has forced upon the Secretary of the Navy. Chief among these is the absolute necessity the Secretary finds himself under of seeking for assistance in the civil branch of his Department. Hence he applies to a bureau having something of a military character. The Bureau of Navigation has been, for some years past, the one selected for this purpose.

But, as clearly set forth in the extract just given, "the inevitable result of throwing large executive duties upon a Chief of Bureau disqualifies him for council." Hence the Secretary finds himself obliged under certain conditions to disregard the narrow limits imposed upon him by law, and go outside of his Department for that assistance he should, under a proper organization, find in his own office. *Necessity has forced the General Board into existence.*

Reverting now to the question, "who is to carry out the orders of the President in regard to a naval armament?" we find that, in practice, it is the Secretary of the Navy, assisted by the chief of one of the bureaus of the civil branch of the Department, acting in conjunction with a temporary board, convened by the Secretary's orders, but having no statutory existence.

Under this arrangement (a result of the experience during the Spanish War, and unknown in 1885), the Secretary is by no means "eliminated from the problem." Quite the contrary. Strengthened and supported by expert councilors, such as recommended by Secretary Jones, ninety years ago, he is enabled to execute intelligently the orders of the President in regard to naval operations. It is now incumbent upon Congress to render this

temporary expedient permanent, as the President has recommended.

What is needed is legislative action based on a liberal and enlightened consideration of the whole subject of naval organization, from both the military and the civil point of view, to the end that the several parts may be so evenly balanced and nicely adjusted that our naval administration may become a model of efficiency and economy.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A STUDY OF ATTACKS UPON FORTIFIED HARBORS.

By LIEUT.-COMDR. W. L. RODGERS, U. S. N.

(*Continued from No. 112.*)

THE CAPTURE OF WEI-HAI-WEI AND THE CHINESE FLEET IN THE JAPANESE WAR IN 1895.

A SUCCESSFUL COMBINED ATTACK UNDER MODERN CONDITIONS.

The Japanese having conquered Korea and seized an advanced base for the navy at Port Arthur while the army was supplied from several ports along the coast of Korea, and an additional march upon Pekin being contemplated, it was impossible to permit the Chinese fleet, based upon the fortified port of Wei-hai-wei, to threaten the oversea communications between Japan and the Gulf of Pechile.

It was decided to support the effort of the Japanese fleet against the Chinese by sending a force of 25,000 troops with 12 field guns, 36 light mountain guns, and 12 mortars, to operate against Wei-hai-wei. This force sailed from Talienwan in three divisions on the 19th, 20th and 22d of January, 1895. On the 18th and 19th three Japanese cruisers bombarded Tungchow, 75 miles west of Wei-hai-wei to create a diversion. The first transport fleet was accompanied by the "main" and second squadrons of the naval fleet (8 ships) and landed at Yung Chung Bay on the northeast extremity of Shantung after a day's passage.

The harbor here is a very good one in winter weather. The landing was opposed by 300 Chinese with 4 guns, but they were dispersed by a few shots from one of the men-of-war, and the landing was complete on the 24th.

During this period of disembarkation the transports were guarded by a division of gunboats while the heavy ships remained at sea, with a division close up against Wei-hai-wei which was re-enforced each night by 10 torpedo boats.

The general advance to Wei-hai-wei, about 35 miles off, was begun on the 26th with the army in two columns, one marching by the coast road and one by the parallel road 4 miles inland. On the 28th the main body was only 6 or 8 miles from Wei-hai-wei and steps were taken to reconnoitre. The heads of columns were at Pao-chia and Chung-chia-kou-tzu, respectively.

The defenses of Wei-hai-wei fall naturally into three groups, those on the islands of Jih and Liu-kung, those on the main land at the northwestern entrance, and those on the mainland at the southeastern entrance. A few small works also commanded the road to Chefu.*

*ARMAMENT:

Tiao-peh-tsu	3	24-cm.	9.4-inch.
Eastern end harbor.....	2	28-cm.	11.2-inch.
Lu-chueh-tsu	4	24-cm.	9.4-inch.
	2	21-cm.	8.3-inch.
Lung-miao-tsu.....	2	15-cm.	5.9-inch.
	13		

Four forts on the land side mounted to protect above:

No. 1.	Hsieh-chia-so	4	15-cm.	5.9-inch.
No. 2.	Yang-feng-ling	2	12-cm. Q. F.	4.7-inch.
No. 3.	Mo-tien-ling	4	12-cm. Q. F.	4.7-inch.
No. 4.	Earth-work	2	12-cm. Q. F.	4.7-inch.
		12		

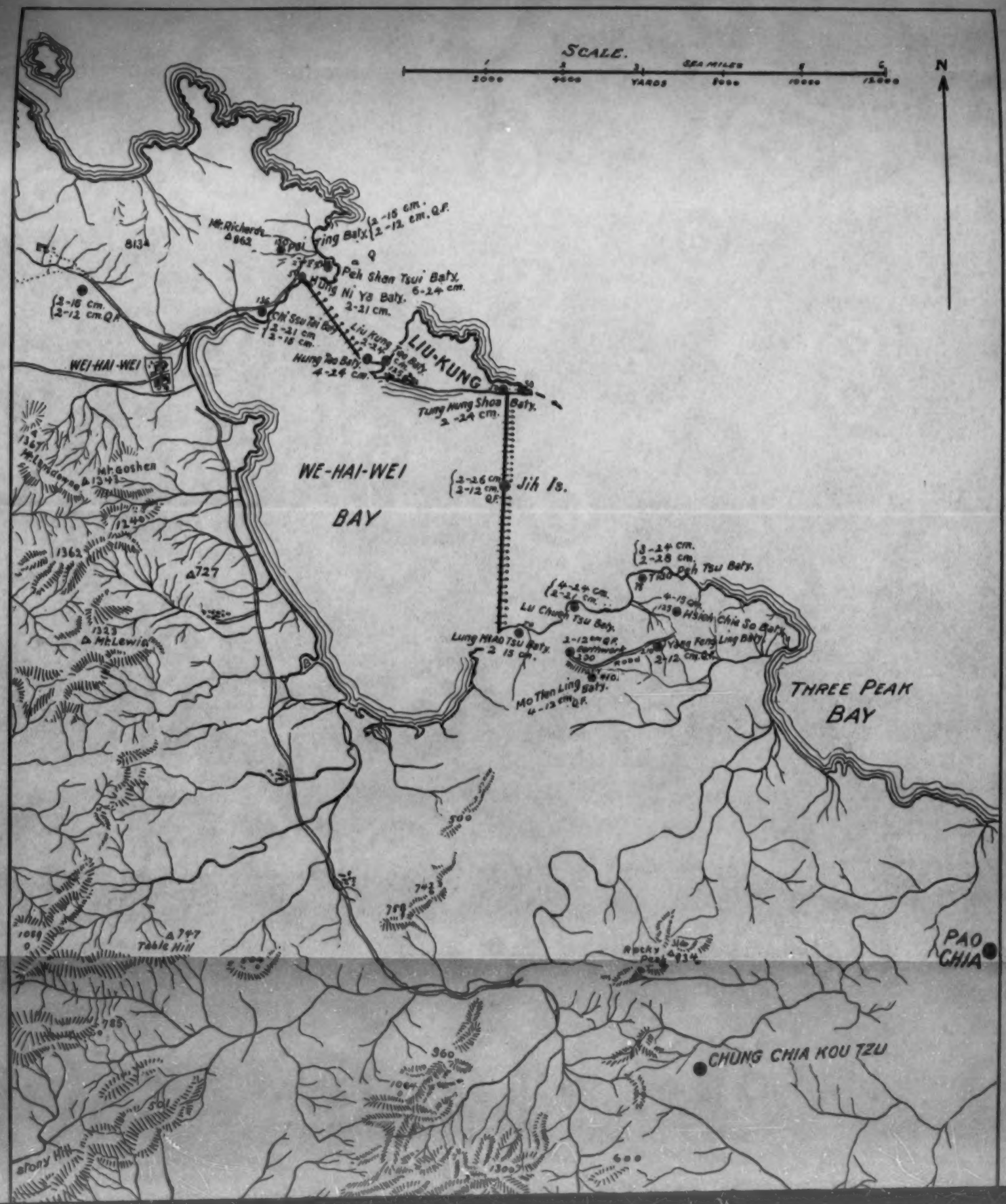
On Jih Island:

2	26-cm.	10.3-inch.	2 were disappearing.
2	12-cm. Q. F.	4.7-inch.	
4			

On Liu-Kung:

Eastern end	2	24-cm.	9.4-inch.
Western	6	24-cm.	9.4-inch.
	8		

There were also disappearing guns.


SCALE.
SEA MILES
YARDS
N
Mt. Richards Δ 862
8134
Peh Shan Tsui Batty. 6-24 cm.
Ting Batty. 2-15 cm. 2-12 cm. Q.F.
Ding Ni Ya Batty. 2-21 cm.
Chi Szu Tai Batty. 2-21 cm. 2-15 cm.
Liu Kung Tao Batty. 2-24 cm.
Hung Tao Batty. 4-24 cm.
2-16 cm. 2-12 cm. Q.F.
WEI-HAI-WEI
LIU-KUNG
Tung Hung Shan Batty. 2-24 cm.
WE-HAI-WEI BAY
Mt. Langerne Δ 1367
Mt. Goshen Δ 1342
1240
1362
Δ 727
1323
Δ McLewin
2-26 cm. 2-12 cm. Q.F.
Jih Is.
3-24 cm. 2-28 cm. Peh Tsu Batty.
4-24 cm. 2-21 cm.
Lu Chung Tsu Batty.
4-15 cm.
Hsiah Chia So Batty.
Lung Mao Tsu Batty. 2-15 cm.
2-12 cm. Q.F. Northward 300 Road
Yang Feng Ling Batty. 2-12 cm. Q.F.
610.
Mo Tien Ling Batty. 4-12 cm. Q.F.
THREE PEAK BAY
500
743
759
1059
Δ 797
Table Hill
Rocky Peak Δ 934
PAO CHIA
785
360
CHUNG CHIA KOU TZU
Stony Hill
1300
600

OPERATIONS AGAINST WEI-HAI-WEI, CHINESE-JAPANESE WAR, 1895.

The booms consisted of steel hawsers 3 inches in diameter, 3 yards apart, floated on large timbers about 9 meters apart.

The garrison included 1500 men on the islands, 3000 in the eastern forts and 3000 in the western forts. The coast forts were all armed with modern heavy B. L. R. guns.

The Chinese fleet inside the harbor consisted of 2 battleships, 5 cruisers, 1 sloop, 7 gunboats, and 11 torpedo boats, manned by 4000 bluejackets. The entrances were obstructed by mine fields and booms.

On the mainland at the eastern entrance there were five coast forts, two of which commanded *Three Peak Bay.* A line of parapet ran along to the west from Yang-feng-ling, and at its most commanding point was a small fort named Mo-tien-ling, armed with field guns; another smaller one was situated a little to its left.

The high peak 3 miles south of Yang-feng-ling commanded a view of the entire locality, and at its foot a small stream ran into Three Peak Bay. This stream was frozen.

On January 29, the Japanese drove in the enemy's line on the southeast, and the right column established its outpost line from

---

On northern shore near west entrance:
3 forts (numbered coming from sea):

1st	6	24-cm.	9.4-inch.
2d	2	21-cm.	8.3-inch.
3d	2	21-cm.	8.3-inch.
	2	15-cm.	5.9-inch.
	12		

Back of these forts for protection against land attack there were two forts:

1st	2	15-cm.	5.9-inch.
	2	12-cm. Q. F.	4.7-inch.
2d	2	15-cm.	5.9-inch.
	2	12-cm. Q. F.	4.7-inch.
	8		

Total of sea-coast guns:

2	11.2-inch.	4	5.9-inch.
2	10.3-inch.	2	4.7-inch.
21	9.4-inch.	37	
6	8.3-inch.		

Three Peak Bay to the high peak, while the left column kept abreast of it.

On January 30, at daylight a general attack began. The left column with very little difficulty carried the ridges between it and the harbor in less than 3 hours, and then a battalion pursued the Chinese along the beach to the west until it came under the fire of some Chinese gunboats.

The right column moved against the key position of Mo-tien-ling, which fell in less than two hours without having inflicted much loss on the Japanese in spite of the supporting and enfilading fire from Yang-feng-ling. Shortly after, the other small fort was carried, so that the Japanese now held all the land defenses on the eastern end and soon took Lung-miao-tsu and turned its guns against the Chinese fleet and island forts. Hereupon the Chinese battleship Ting Yuen, which, with the Chinese gunboats, had held back the Japanese infantry, steamed up to the fort and silenced it in half an hour.

As the army started its movement 6 ships of the Japanese light division steamed into Three Peak Bay and opened a long-range fire on the two eastern forts which lasted till nearly noon.

The Japanese troops on the crest above these forts now experienced a heavy fire from them (the forts) as well as from the Chinese fleet, but the Japanese held a very commanding position and replied by a heavy fire from their mountain batteries and from the captured field guns at Mo-tien-ling.

Shortly after noon, Yang-feng-ling caught fire and was abandoned, and Hsieh-chia-so was immediately evacuated; five minutes later an explosion in Tiao-peh-tsu caused its garrison to withdraw. All these retreating troops suffered heavily as they ran along the shore to the town.

The Chinese admiral now landed a party of bluejackets who made a bold attempt to destroy the guns in the remaining two forts, but they were too late, and before 1 p. m. the Japanese occupied them. The Japanese had brought bluejackets from Talien-wan with the army for the express purpose of manning the captured forts, so they were able in half an hour to open fire on Jih with three out of the four 9.4-inch guns in Lu-chueh. This drew the attention of the Chinese forts and ships, which concentrated on Lu-chueh and disabled two of the guns; the other did not cease fire till 4 p. m., when the Chinese ceased also.

This ended the day's fighting. All the eastern forts were carried by the Japanese, who then controlled one end of the eastern boom and the submarine mines there. One Japanese division spent the night about the captured eastern forts and the other remained south of the southern part of the harbor. This night the Japanese admiral attempted to send the torpedo boats inside the harbor, but in his haste he neglected to warn the army, and the boats were driven back by their own troops.

On January 31, preparations were made for future operations; particular efforts were directed to putting the guns of the captured seacoast forts in condition for use. A projected torpedo boat attack was abandoned on account of a gale with snow.

On February 1, the left column moved towards Wei-hai-wei by a long sweep over the hills in a heavy snowstorm, the direct road along the coast being covered by the Chinese fleet. The weather was so bad that with the exception of a single squadron the blockading fleet withdrew to Yung-Cheng Bay.

On February 2, the left column took unopposed possession of the western forts, whose guns had been disabled by a party of Chinese sailors sent for the purpose by their admiral when he saw the soldiers deserting.

The work now remaining for the Japanese forces was the reduction of the island forts and the capture or destruction of the Chinese ships by means of the navy, aided by the captured forts.

The 3d of February was fine and both sides carried on a heavy fire; the Japanese fleet and the eastern forts bombarded the eastern works on Liu-kung. The forts continued to fire on each other during the night. At night the torpedo boats attempted to cut and remove a part of the boom, but failed, although they found a narrow and difficult passage between the end of the boom and the mainland.

On the night of the 4th a section of the boom 100 yards long was removed, and at 3 a. m. on the 5th, after the moon had set, 10 torpedo boats organized in two flotillas started into the harbor, but only 8 got by the obstructions; the others got ashore. Only 4 boats actually attacked, firing 8 torpedoes; of the others, one had her tubes frozen up, and the others were injured themselves or turned aside to aid the cripples. The first flotilla to pass in moved to the western shore before attacking, but the second had lost so much time at the boom that it moved straight on the

Chinese ships before Liu-kung, where a gunboat and torpedo boat lay in front as pickets. The Ting Yuen, battleship, was sunk in shallow water by a torpedo, while the Japanese lost one boat and two others were so badly damaged as to be sent to Port Arthur for repairs.

On the following night the first flotilla of 5 torpedo boats was sent into the harbor at 4 a. m., while the other two flotillas made a demonstration at the western entrance. The attacking flotilla ran to the west side of the harbor and then attacked the fleet as on the previous night, firing 7 torpedoes and then retired, having suffered no damage. In the morning 2 Chinese gunboats and a small transport were found to be sunk.

On the 7th, the Japanese fleet, at long range, and the captured forts opened a general bombardment and the fort on Jih was silenced by those south of it. During the bombardment 11 Chinese torpedo boats left the harbor by the west entrance and ran for Chefu. All were captured or destroyed by the first flying squadron.

The absence of this Chinese flotilla enabled the Japanese to place twelve 9-cm. mortars near one of the western forts so as to bring an artillery fire on the west end of Liu-kung and on the Chinese fleet. By their R. F. and machine gun-fire the Chinese boats had prevented all movements of the Japanese troops about the western forts.

On the nights of February 8-9 and 9-10 two sections of the boom were destroyed.

On February 9, there was another general bombardment; one of the eastern forts sunk a Chinese cruiser while the new mortar battery on the western mainland silenced the western fort on Liu-kung.

On February 11, there was another bombardment and on the 12th the Chinese offered to surrender. Negotiations followed and the surrender was completed on the 16th.

The losses of the Chinese on Liu-kung were not very heavy and should not have brought about a surrender.

The bombardments by the Japanese fleet were intended merely to draw off some of the Chinese fire from the eastern forts, and the ships, therefore, kept at long range—4000 to 6000 yards. They lost 8 killed and 34 wounded in all.

The campaign of Wei-hai-wei had a purely naval objective, the

destruction of the Chinese fleet; nevertheless, as in previous campaigns, so here, we see the army taking a principal part, although the territory about Wei-hai-wei was of no importance to the general plan of invasion.

But here we see for the first time that the heavy ships of the navy wisely decline to seek a close fight and confine themselves to a long-range and consequently ineffective cannonade.

The auxiliary craft, the torpedo boats, on the contrary are very prominent and take a decisive part in the destruction of the Chinese fleet, which is the sole objective. But this action of the torpedo boats was possible only through the previous success of the army in occupying Tiao-peh-tsu, and the southern mine field firing station. Thus the attacking army's action disabled the mine fields. On the other side the great support which the Chinese ships lent the defending troops is very remarkable, and the opposition offered by the torpedo boats to the western Japanese troops is even surprising.

Santiago.

The campaign against Santiago is a very instructive one as to the attack of fortified harbors. As it was so recent, what was done there is well known to all, and I shall merely offer some observations on the plan of the campaign.

The declaration of war was made for the object of delivering Cuba from Spanish occupation, and Cuba was necessarily the principal theater of operations. The Spanish army of occupation could be brought to terms either by starving it into surrender by a blockade of the island, which was already devastated and disordered, or a field army could be thrown into the island to attack the Spaniards.

The first plan was not seriously considered, not only because the United States navy was not thought strong enough to surround the island with a close blockade, but also because the inhabitants of the island would suffer with the Spaniards.

The second plan was favorably viewed and the administration wished to put 70,000 men ashore in Cuba near Havana to oppose the Spanish army in the western part of the island, and it was expected that the operations of this army would be the principal feature of the war. As such an army did not exist at the outbreak of the war, it was necessary to recruit and organize it.

Success, however, would be almost sure to fall to that one of the two combatants who should preserve his communications with home. As Cuba is an island and the sea is the only means of communication, it was impossible for the United States to think of launching an army against the principal Spanish position about Havana until a decisive naval battle should enable the army to embark without any anxiety for the subsequent security of communications.

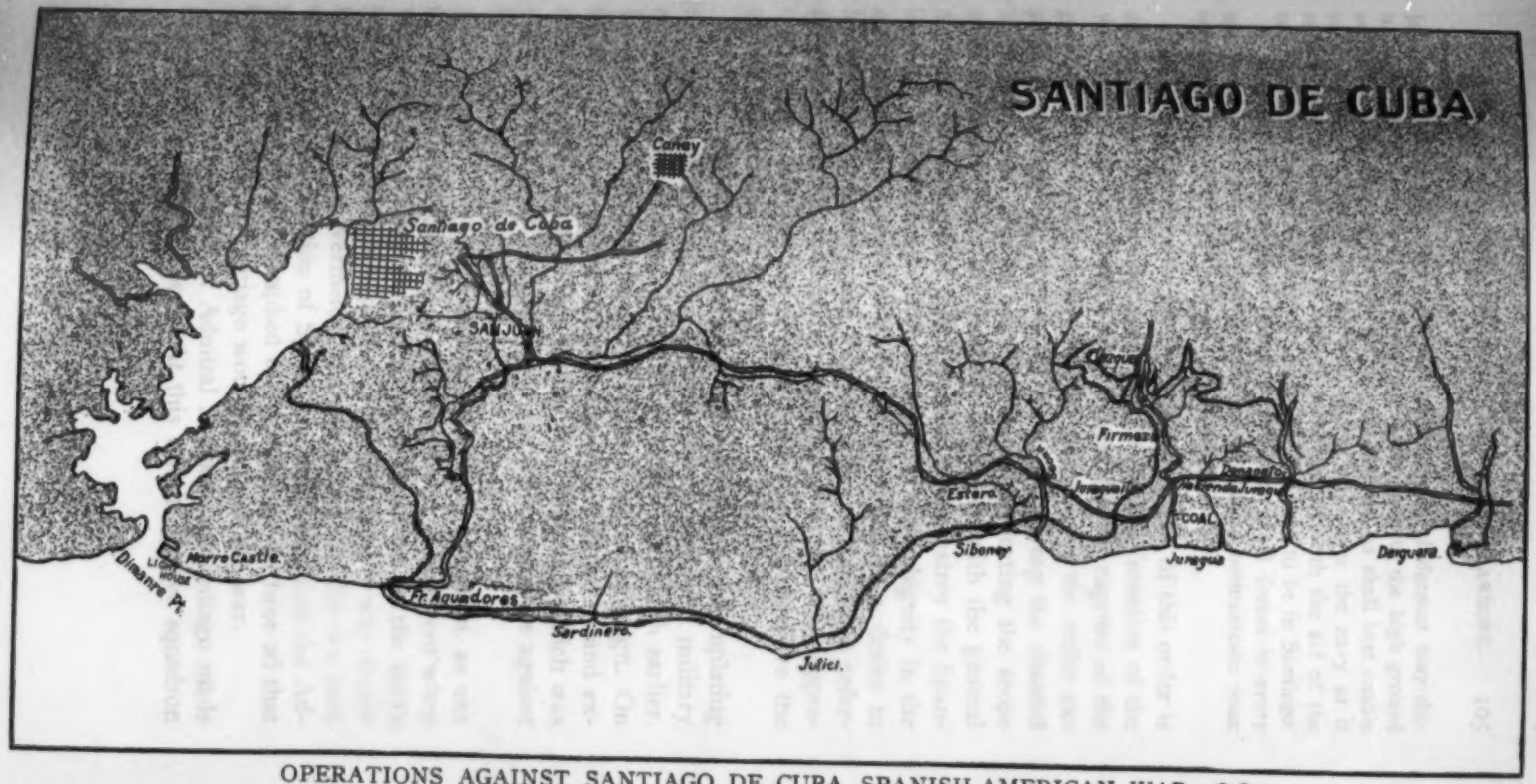
Accordingly the news of the departure of Cervera's squadron for the West Indies was welcome to the administration, as it hastened the solution of the problem by bringing the Spanish fleet, an essential factor in the situation, within the theater of operations.

When reports reached Washington that Cervera had entered Santiago de Cuba it was the immediate wish of the Navy Department to verify the news, and then retain him under observation until a sufficient force could be assembled to destroy him. Although the defenses of Santiago were far from strong, yet the guns and mines offered proper support to each other, besides having the Spanish fleet in reserve, so that were the navy to attempt to force its way in alone it would very possibly lose a ship or two. In the threatening condition of the relations of the United States with continental Europe it was impossible for the administration to contemplate with equanimity even the smallest reduction in our naval force, and imperative orders were sent to Admiral Sampson not to take undue risks against forts.

For these reasons it was arranged by the War and Navy Departments, at the suggestion of the latter, that as soon as the navy should blockade the Spanish fleet, a sufficient force of troops should be sent to aid the navy in opening the harbor preliminary to attacking the Spanish fleet.

On the 27th of May the Navy Department informed the War Department that it expected soon to be able to call for the army to move. On May 29, a sufficient force arrived before Santiago to make the blockade effective, and the same day it verified the presence of the Spanish fleet within, and reported the facts to Washington by cable from Hayti. On May 31, General Shafter was directed to move his army corps to Santiago in the following terms:

. . . . You are directed to take your command on transports, proceed under convoy of the navy to the vicinity of Santiago de Cuba, land your



OPERATIONS AGAINST SANTIAGO DE CUBA, SPANISH-AMERICAN WAR, 1898.

SANTIAGO DE CUBA
OPERATIONS AGAINST SANTIAGO DE CUBA BY SPANISH-AMERICAN WAR, 1898

force at such place east or west of that point as your judgment may dictate, under the protection of the navy, and move it on to the high ground and bluffs overlooking the harbor or into the interior, as shall best enable you to capture or destroy the garrison there; and cover the navy as it sends its men in small boats to remove torpedoes, or with the aid of the navy capture or destroy the Spanish fleet now reported to be in Santiago. .... You will cooperate most earnestly with the naval forces in every way, agreeing beforehand upon a code of signals. Communicate your instructions to Admiral Sampson and Commodore Schley.

If each clause in the first and principal sentence of this order is duly weighed it becomes apparent that it was the intention of the War Department to prescribe a movement for the capture of the garrisons of the harbor forts, for the purpose, as the order explains, of covering the navy in its work of clearing the channel by its small boats. As an omnibus clause, indicating the scope of the entire campaign, the sentence concludes with the general direction, " with the aid of the navy, capture or destroy the Spanish fleet." Unfortunately there exists a verbal ambiguity in the construction of the sentence (very possibly due to a desire to facilitate the enciphering) and this ambiguity, if the clause referring to covering the small boats of the navy be not fully appreciated, might allow the recipient to regard as his objective the garrison of Santiago.

It is thus seen that the administration was not contemplating the expedition to Santiago as a substitute for the great military enterprise against Havana which it had debated a month earlier. It was not even a diversion in favor of the Havana campaign. On the contrary, the expedition to Santiago was intended as and expected to be solely an auxiliary to the naval campaign which was seen to be a necessary preliminary to any field operations against Havana.

How correctly the administration viewed the situation, as one governed by the question of sea-communication, is apparent when we recollect that the report of a Spanish squadron on the north coast delayed the departure of the expedition until it was shown to be unfounded. Nevertheless the administration did not look as deeply into the question of Spaish communications as did Admiral Sampson, who telegraphed to Washington on June 26 that in his belief success at Santiago would terminate the war.

On June 1, the arrival of Admiral Sampson at Santiago made the blockade an effective one. At this time a reserve squadron

was fitting out in Spain and news of its completion was daily expected. Owing to its central position with regard to the two theaters of war in the West Indies and the Philippines, it had a free choice of its field of operations, and at Washington it was believed to be sufficiently strong to turn the balance of strength in either field.

As General Shafter's force was delayed at Tampa for lack of transportation, so that Cervera was temporarily secure from attack, the Navy Department became very anxious to contain his force in order that Admiral Sampson might detach against the Spanish reserve squadron. The collier Merrimac was therefore sent into the channel and sunk there on the night of June 3, in order to prevent the egress of Cevera's squadron. On June 6, the forts at the harbor mouth were bombarded and silenced by the fleet, but suffered and inflicted no material damage. Although the forts were thus shown to be unable to oppose the fleet, the topography of the entrance was such that the heavy ships could not cover and protect the small craft from infantry fire should they be sent to clear the channel of mines and obstructions. In reporting the affair Admiral Sampson urged the immediate despatch of the troops, and still erroneously believing that the Merrimac closed the channel, he suggested that delay in the arrival of the army would give the Spaniards an opportunity of removing the ships' guns to add to the land defenses, and stated that 48 hours after the arrival of troops the city and fleet would be captured.

On June 10, the lower part of Guantanamo Bay was occupied by the fleet as a base for carrying on the blockade of Santiago and a battalion of marines was landed to secure the ships from annoyance by the enemy on shore.

On June 16, the forts at Santiago were bombarded again and readily silenced. On June 20 the army arrived off Santiago and after consultation between General Shafter, Admiral Sampson and the commander of the Cuban irregular troops, it was agreed that the army, assisted by navy boats, should land about 18 miles east of the harbor and march to attack the forts at the harbor mouth entrance, and that to facilitate the landing feints should be made both east and west of the entrance and that the navy should shell the landing place in order to drive away any possible opposition. The 21st was occupied in arranging details

and issuing necessary orders. On the 22d the disembarkation began. On this day General Shafter wrote to Admiral Sampson saying he would advance on Santiago as soon as he could and requested Admiral Sampson "to keep in touch during the advance and be prepared to receive any message I may wish to transmit from along the bluff or any of the small towns and to render any assistance necessary," thus showing his intention of attacking the harbor forts. About 6000 men were landed on the 22d and a strong force was sent to the west and seized a second landing place about 8 miles down the beach, where troops and stores were landed on the 23d. About 6000 more troops were landed this day and all the troops, 16,000, were on shore on the 24th, but it was very difficult to establish a reserve of stores, as landing on an open beach is not easy. The orders for the 24th of June contemplated the retention of a position near the landing place until a sufficient reserve of stores had been accumulated on the beach; but General Shafter's headquarters remaining on board ship, the senior officer present, upon his own responsibility, directed an advance upon the rear of Santiago, and committed the army to a plan of operations which the commanding general had not thought of.* Not only did this movement forsake the key of the military position and throw away naval co-operation, but it entailed great difficulties in supply owing to the expedition's lack of transport and the bad roads—difficulties which would have been avoided had the army remained near the beach.

Under these circumstances the navy could do no more than maintain a close blockade and see that during operations thus prolonged the army should not suffer by having its store ships driven away.

On June 28, General Shafter learned of the advance of Spanish re-enforcements marching from the west, and on June 29 he moved his headquarters on shore and arrived at the front the following day. On June 30, General Shafter notified Admiral Sampson that he would attack the city the next day and that he would make a demonstration with a regiment against Aguadores, three miles east of the Morro, and requested the admiral to support this demonstration in order to divert the defense before the city. Here we see that the movement along the beach upon the harbor forts, which the administration had contemplated as the

*See General Miles' testimony.

principal one in front of Santiago, was reduced to the role of a simple demonstration, and that the major and minor operations had exchanged parts in the mind of the commanding general. The navy carried out its share in this demonstration as requested on July 1, and on the following day also, but although the ships present repeatedly assured the co-operating brigade that an advance would find the enemy's position abandoned, yet no movement was made to take possession and a very promising opportunity was completely lost. On July 1 the American troops made a general attack on the outer works of the Spanish position outside of the city, which was unsuccessful, and was continued the next day, so that by the 3d of July the investment was complete on the north and east sides of the city. Nevertheless, in spite of his success the general informed Washington that he thought of falling back from the position he had just won owing to difficulties in supplying his troops from Siboney.

On July 2 a very curious correspondence occurred between Shafter and Sampson. Shafter first telegraphed to Sampson:

July 2. Terrible fight yesterday, but my line is now strongly entrenched about three-quarters of a mile from town. I urge you to make effort immediately to force the entrance to avoid future losses among my men, which are already very heavy. You can operate with less loss of life than I can. Please telephone answer.

W. R. Shafter, *Major-General.*

The following reply was telephoned by Admiral Sampson's flag lieutenant:

Admiral Sampson has this morning bombarded forts at entrance of Santiago and also Punta Gorda battery inside. Do you wish further firing on his part. . . . . Impossible to force entrance until we can clear channel of mines, a work of some time after forts are taken possession of by your troops. Nothing in this direction accomplished yesterday by the advance on Aguadores.

Shafter replied as follows:

It is impossible for me to say when I can take batteries at entrance to harbor. If they are as difficult to take as those we have been pitted against, it will be some time and a great loss of life. I am at a loss to see why the navy cannot work under a destructive fire as well as the army. My loss yesterday was over 500 men. By all means keep up fire on everything in sight of you until demolished. I expect, however, in time, and sufficient men, to capture the forts along the bay.

Shafter.

To this Admiral Sampson replied in a letter from which the following extract is made:

> Our trouble from the first has been that the channel to the harbor is well strewn with observation mines, which would certainly result in the sinking of one or more ships if we attempted to enter the harbor; and by the sinking of a ship the object of the attempt to enter the harbor would be defeated by the preventing of further progress on our part. It was my hope that an attack on your part of these shore batteries would leave us at liberty to drag the channel for torpedoes. If it is your earnest desire that we should force our entrance I will at once prepare to undertake it. I think, however, that our position and yours would be made more difficult if, as is possible, we fail in our attempt. We have in our outfit at Guantanamo 40 countermining mines which I will bring here with as little delay as possible, and if we can succeed in freeing the entrance of mines by their use, I will enter the harbor. This work, which is unfamiliar to us, will require considerable time. It is not so much the loss of men as it is the loss of ships which has until now deterred me from making a direct attack upon the ships within the port. W. T. Sampson.

Thus we see that the commanding general, having allowed the act of a subordinate, contrary to positive orders, to commit the army to a difficult line of operation, ill-suited to the early attainment of the object of the campaign, and having met with more difficulties in his operations than he had previously expected, and foreseeing others to come, then called upon the navy to save him from the consequences of his act by doing the very thing to prevent which the army had been sent out. General Shafter shows that he regarded the problem before him and the admiral as simply a question as to whether the additional loss of life necessary to complete the campaign should be made to fall upon the army or the navy, and as the army had lost 500 men, he intimated it was now the turn of the navy to suffer an equal loss before the army should be expected again to exert itself. Really the situation was very different. Every commander-in-chief afloat or ashore must consider the political situation of the country as controlling the military action, and in modern times the telegraph to headquarters nearly always confers the means of executing this duty in a way satisfactory to the administration. In the present case it was a matter of notoriety that continental Europe was unfriendly towards the United States, and the administration feared that the loss of a single United States battleship without corresponding loss to the Spanish fleet might serve to crystallize a coalition against the United States which would be more disastrous than

any loss of life, either in army or navy, which reasonably could be expected in front of Santiago. Moreover, should the United States lose a ship in the channel while forcing its way in, the channel might be obstructed so that the fleet would be divided into two parts, the one inside too weak to cope with Cervera's force and the other unequal to the Spanish reserve squadron. In this case the transport fleet of the United States army would be very vulnerable and an attack on it would cause the force in front of Santiago to starve, as the reserve of supplies on shore was too small.

A personal interview was arranged between the two commanders-in-chief to reconcile their views, but before it could take place the Spanish fleet came out and was destroyed on July 3. On the same day the Spanish reenforcing column entered Santiago. On July 4, General Shafter sent word to the city of the loss of the fleet and demanded its surrender. On the same day he renewed his request to the admiral to have ships force the entrance and sent the same request to Washington, asking for 15,000 troops additional in case the navy should not enter. He failed to see that, although the capture of the city and garrison was now the sole object of continuing the campaign owing to the elimination of the Spanish fleet, yet this did not effect the military situation at Santiago, whose key remained as before on the hills at the harbor mouth. Not only had sickness made its appearance in the army, but the bad season was approaching and passing supplies over a surf-beaten beach was a task of difficulty. Even then, had the detachment at Aguadores been sent against the harbor forts, supported by the fleet, the clearing of the channel would have enabled the naval guns to complete the investment of the city to the west, would have brought the garrison under the heavy guns of the fleet and would have transferred the base from the uncertainties and difficulties of an open sea beach to the security of a fine harbor, besides avoiding most of the difficulties of forwarding supplies from the base.

The general telegraphed to Washington on July 5: "The only safe and speedy way is through the bay; am now in position to do my part." He had forgotten what he had acknowledged to Admiral Sampson before landing, that the key of the situation was the harbor forts. The President ordered a conference between the admiral and general, to agree upon a joint plan, and on July 6

they decided that three days' truce should be given to the Spaniards to consider surrender, after which the navy should bombard the city from the sea. Should this prove indecisive, the navy would send one thousand marines with some Cubans to assault the Socapa batteries, after which some of the smaller ships of the squadron would try to enter (after countermining). That is to say, it was now agreed that the navy should undertake the land assaults upon the forts, while the army was to retain the Spanish forces within the city.

Fire had ceased on July 4 and negotiations for surrender continued until the afternoon of the 10th, when the artillery of both sides opened and the ships outside added a long-range fire against the city. On July 11, the bombardment was renewed afloat and ashore and the investment of the city was made continuous. In the afternoon fire ceased for the last time. Negotiations for surrender were resumed until the 16th, when the surrender was completed to include all Spanish troops in the eastern extremity of the island.

This wide-reaching surrender was the direct result of the destruction of the Spanish fleet; for the controlling element in the military situation in the opposing lines, and indeed throughout the province, was the question of communications and supplies. The blockade was starving the Spanish army and after the Spanish fleet was destroyed there was no hope of raising the blockade, so Santiago was ready to surrender. In fact, the Spanish government soon perceived its inability to hold the rest of Cuba and grasped the lesson sooner than did our own, although Sampson had early perceived that success at Santiago probably would terminate the war.

The movement on Porto Rico was another blow at Havana, as it deprived Cuba of a necessary intermediate base on the route to Spain, but the destruction of the Spanish fleet so completely interrupted communications that the attack on Porto Rico did not hasten the conclusion of peace, but merely served to throw that island into United States possession when the peace was signed.

It is interesting to compare this campaign with those against Cartagena and note how unvarying is the character of the Spanish defense through three centuries. In each case the garrison fired and fell back as long as it could, sacrificing every outpost and everything it could not take with it, and finally, when in the last

ditch, it fought and died bravely, to save personal honor, without ever having made an attack, or shown a wish to make the enemy die with it or before it.

The instructive points about this campaign are:

1. A system of fortification, weak but properly combined with a mine defense believed by the attacking force to be fairly efficient was enough to prevent a naval passage.

2. The necessity that the principal officers in joint operations shall have a very clear comprehension of each other's requirements and capabilities and each thereafter do his part.

In the present case the army was sent to act as an auxiliary to the navy in a naval campaign. The commanding general overlooked this to such an extent that he thought the military operations were the principal ones and called on the navy to sacrifice itself and risk the success of the campaign to further his own immediate object. Had the forts at the harbor mouth been taken on June 24 or 25, as probably they might have been, and the Spanish fleet destroyed a day or two later, it is probable that the Spanish garrison of Santiago would have marched into the interior, and the loss of life before Santiago would have been avoided. In this case the Porto Rican campaign would have been the conclusive one and the war would have ended no later than it actually did.

The resemblance between this campaign and that of Wei-hai-wei is both striking and instructive. In both cases the principal movement of the army of the invading nation was suspended until its sea communications should be assured through the destruction of the hostile fleet. In both cases, likewise, the more active part of this operation, naval in its scope, fell to the share of a large detachment of the army operating eccentrically in a region outside of its own special theater, while the supporting navy had only a secondary part. But in the Japanese campaign the leaders of the army and navy better understood what should be their mutual relations and executed their respective parts with more harmony than was the case of the United States.

Conclusions as to the Attack of Fortified Harbors.

drawn from the preceding accounts of typical campaigns.

The campaigns which have been described have been selected as representatives of operations against sea ports. Let us now

see if we can perceive a general reason which explains why each place was selected as a point of attack.

It is evident that in every case mentioned the attack on the harbor was made with the object of affecting a chain of water communications, either military or civil. Sometimes the attack was for the object of improving or securing the attacker's lines of water routes, sometimes it was to injure the enemy's lines. Sometimes the port was an ocean port, sometimes one on interior waters; but in each case the attempt to capture a harbor was dictated by some relation it had to lines of water communication.

Even when the objective was a hostile fleet behind the fortifications the reason for the attack still was to secure one's own communications by destroying the enemy's fleet. If we sketch out a probable course of the campaign in a supposititious war, the harbors which will become a part of the necessary lines of communications for that campaign will be clearly apparent, and the degree of preparation and defense proper for each one will depend upon its relative importance to the operations of the war.

To be sure, raiding and wanton destruction of fortifications and the property near them is always possible, but it is becoming more unlikely every year; not so much on account of the prevalence of humanitarian views, nor of the increasing limitations upon belligerent rights, but because the improvements in the transmission of news and in transportation of every sort makes it unwise to scatter the combatant forces in minor operations. Great defensive works are needed only by those ports which are essential as bases of operations, whether commercial or combatant.

It appears from the examples we have considered of attacks upon fortified harbors that such may take place either by the navy alone or in conjunction with an army. In both cases the operations may include a period of slow approach and preparation on the part of the navy analogous to a military siege, or they may consist only of a sudden attack analogous to a military assault.

In this country the success of Farragut's principal actions and their important consequences have much misled unreflecting opinion; and the fact that his assaults were followed by a passage to the other side of the defenses, has led most persons in this country to think that "forcing the passage," as it is called, is the normal form of naval attack upon a fortified harbor. If

we think of the operations before Charleston, we must recognize that when Dupont made his assault he did not think of forcing the passage; and, later, Dahlgren, who relieved him, drew up a memoir justifying himself for not running in. From a comparison of the situations in the Gulf with that at Charleston, it seems clear that Farragut ran inside because by doing so he, in co-operation with the army, completely invested the enemy's position and cut all his lines of supply, while maintaining his own communications intact. At Charleston, on the other hand, a passage of the forts by the navy would have been profitless unless the army had made a simultaneous successful attack on Fort Johnson, for the forts would have kept their own communication while the ships would have been cut off.

Thus we see that "forcing a passage" is not justifiable unless the fleet gain a positive advantage with regard to the enemy without sacrifice of its own lines of communication. These conditions will rarely occur, although they are associated with the most brilliant achievements of our navy.

Having thus glanced at some of the principal conditions which determine the propriety of attack, we must now take up the question of methods to be followed. Let us try to decide what features are fixed and what are variable in the plans and operations we have considered.

The methods of attack are necessarily governed by the means of defense. Not only during the period of three hundred years from which we have drawn our examples, but farther back in history, as far back as the siege of Tyre by Alexander, we may see that there have always been two ways of defending a harbor from a naval attack. The defense may resist by striving either to destroy the lives of the attacking forces, or to delay and injure the ships that carry them. It does not seem that there can be a third way. It has always been feasible for a sufficiently powerful attack to deal successfully with either mode of resistance, and therefore in every age a properly devised system of harbor defense has combined the two plans of resistance so that they might reinforce each other and thus oblige the enemy, in shunning Scylla, to fall into Charybdis.

Ever since the invention of cannon they have been used as the armament of ships and of harbor defenses. In both cases they damage a ship's hull and destroy lives on board. Sometimes the

ship thus attacked by gun-fire is destroyed by it and always she is more or less damaged. But in the very great majority of cases throughout history the loss of life owing to the gun fire decides the battle and not the injury that the gun inflicts upon the hull. Usually a new crew only would restore to the ship most of her formidability. Similarly, in using guns against forts more or less damage is inflicted upon the armament within the fort, but in every century it has been a fact that the damage to the materiel is not usually conclusive, but the effect of the fire upon the morale and lives of the defenders is conclusive. The same is true in the case of field artillery, a defeated battery has usually suffered more in its men than in its guns. Thus in spite of frequent efforts of gunners to select certain materiel for their object of destruction, in all ages and under all conditions the effect of artillery fire usually is chiefly upon personnel. Although gun-fire often inflicts very grave injuries upon materiel, yet we have never been justified by history in *predicting* such injuries to be as influential upon the course of battle as the concomitant loss of life. Thus we may regard the gun (in modern times the high-power gun) as a weapon directed against life, its effects upon materiel are incidental only, although often of great importance.

The power of the guns on shore relative to the protection provided for the crews of the ships has not varied greatly through several centuries. The gun of the day has been thought powerful enough when it could pierce the side of a contemporary ship at a moderate range. Moreover, we find that the relation of the gun afloat to the gun in the harbor defenses has been constant also, both in size and in protection, and further that the gun ashore may be attacked by the gun afloat in two ways, either by a fire of large missiles to disable the gun, or a more rapid fire of small missiles to disable the gun detachment. It also appears that the relative value of a battery on shore to that of one afloat is a function both of the relative degree of protection that each enjoys as well as of the relative volume of fire that each can deliver. Fortifications, ships and cannons have always been so related that ships have needed a very considerable superiority in volume of fire to engage shore batteries without severe loss, and when the ships have suffered little it is more often because the gun detachments are driven away than because the battery is badly injured. With regard to the gun, therefore, we conclude

that its use and tactics in the future will be what they have been in the past without being much affected by possible changes in guns and armor. The gun's function is primarily to destroy life.*

Next let us consider the means available to the defenders of resisting the ships themselves. These have always been of two kinds, strictly passive obstructions or obstacles, such as chain barriers, floating booms, sunken wrecks or piling, etc., and active means of inflicting injury upon the ships. In the latter class fire ships have always been employed, but they have been serviceable only under special circumstances. In closed waters they have usually been ineffective so that they have not been generally regarded as important. The submarine mine was the earliest addition of a practical kind to the ways of injuring the ship, and this was followed by the spar torpedo, the automobile torpedo, and latest, by the submarine boat carrying an automobile torpedo. In these various ways of opposing the ship, as distinct from opposing the crew, we see a progressive change from a bare passive resistance to the advance of the underwater body of the ship, towards an increasingly active attack upon the same underwater body, with the submarine boat and its torpedo as the farthest point of the development. The submarine boat is now a mechanical success, but experience has not developed proper tactics. In attempting to use it we are in the position of a man who for the first time picks up a sword. He can wound an unskilled opponent with it immediately, but to parry with it or to wound a practiced adversary is a matter calling for much training. Nevertheless, whatever may be our present doubts as to the proper tactics of employing submarines, we may be sure that they have come to stay because they conform to the natural line of progress in harbor defense, which we have seen to be that of increasing the activity and efficacy of resistance to the underwater hulls of ships.

Another means of resistance directed primarily against the structure is the mortar. Although the fire of high-angle artillery has been used a very long time, yet until quite recently it has not been sufficiently accurate to be applicable against moving targets on the water, and therefore it is only within the past few years that mortar batteries have been extensively employed for coast defense. Seacoast mortars endeavor, if possible, to sink ships by

* Of course, these remarks do not apply to the use of breaching batteries in siege operations.

complete penetration, and therein lies their peculiarity which classes them apart. High-power guns act principally against life, and mortars principally against materiel. The mortar differs from other weapons whose main action is against the ship in that it is placed upon the land. It also differs from other seacoast guns in that it is generally so placed that it is not as liable to injury from ship fire as high-power guns.

Let us now turn to methods of attack. As was before remarked, through all the centuries a good defense has so combined a plan for injuring the persons of the attacking forces with one for injuring the ships themselves that the two plans shall reinforce each other. Therefore any good plan of attack should endeavor to encounter only one of the two methods of resistance. Throughout the centuries there has been only one sure way of accomplishing this; namely, by making the principal attack by the shore and not involving the ships themselves to such an extent as to risk serious injury to them. Just here is the point where modern inventions have affected tactics, but in detail only, not in broad principles. In the past the resistance to the ships was passive and immobile, and therefore in the struggle for the possession of a fortified harbor it was the proper sphere of the fleet to use its heavy artillery freely in aiding the force on shore, since the fleet was always at liberty to retire without danger of a counter attack. At the present time the defense employs to advantage an active mobile counter-attack upon the under water hull, and it is to be expected that in the future, more than in the past, attack upon fortified harbors will take the form of a military siege, while the navy will act as a covering force.

Indeed we may consider that the late operations against Wei-hai-wei and Santiago which we have examined and where the navy took such inactive parts in spite of the exclusively naval objectives, we may believe, I say, that these campaigns clearly foreshadow future practice. This view is confirmed by the thought that a harbor is attacked because it plays a part in a system of communications. But a fleet's duty is to occupy a region and control the sea communication therein, and so it is poor policy to gain a desirable seaport by the sacrifice of ships which are the very means of utilizing the capture. In other words the ships of a fleet should actively assist in the capture of a seaport only when their probable losses will not affect their control of the sea.

Thus a comparison of past operations leads us to the conclusion that the attack on fortified harbors must be, in the future, chiefly a work for an army; and the navy, as a rule, should confine itself to maintaining and protecting the sea communications of the besieging army.

Defense should avail itself of every opportunity for counter attack. In the past the naval support and supply to the siege operations has always been liable to such a counter blow; which, when successful, must cause the attack to collapse. But here again is a point of difference between old means and new, and therefore between old and new tactics. Formerly channel obstructions were almost as much as an obstacle to the exit of the defenders from the harbor as they were to the entrance of the besiegers; and therefore the counterblow usually came from the outside With proper control of the sea on the part of the attack this outside counterblow, of course, could not come at all. At present, with channel obstructions which do not restrain friendly forces the counterblow is deliverable from within the harbor where a refuge is at hand after striking. Further, the development of mobility in the means of attack on ship's bottoms has provided a readily available means of delivering a very formidable counterblow.

As was the case in the past, so in the future, the maintenance of contact between the naval and transport fleets on one hand and the besieging army on the other, will always be the most important feature of the entire campaign, but the defense's newly acquired capability of delivering an effective counterblow on the water from within the harbor transforms this maintenance of contact to something far from what it used to be, and makes it the vulnerable and critical feature of the operations.

A skilful admiral in performing his part in capturing a harbor will, therefore, rather withdraw his heavy ships; holding them in reserve for use against a relieving fleet, and will develop the greatest activity in picket duty on the part of his gunboats, torpedo boats and submarines in order to prevent the similar craft of the enemy from interfering with the transport fleet. He will, if possible, send his light craft, particularly the submarines, inside against the hostile vessels there. The besieging army will regard it as its duty to attack and annoy all hostile shipping inside no less than to advance its siege operations, because the ships of the

defense will operate against the besiegers line of supply, when they go outside to deliver the counterblow; and when inside, they will very considerably limit the action of the besiegers' field forces within their own lines. The active naval work of the campaign on both sides will therefore largely take the form of picket work, mining and countermining, and minor attacks by gunboats, torpedo boats and submarines.

All classes of work except the last are fairly well known through experience. But with regard to the tactics of submarines we know nothing. Hostile submarines are in the position of two duelists armed with knives and turned loose in a dark room. Both will want to see, and I am inclined to think that submarines will sacrifice much of their invisibility for the sake of acting quickly and with certainty.

But here we are going into the field of speculation. There can be no doubt, however, that they will play an important role, because our historical examination shows us that they are in the line of progress of three hundred years.

Thus, to conclude our study, we may say that, as formerly, so in the future, the sea-coast guns of all descriptions and the channel obstruction will be the foundations of harbor defense. But, whereas in former times improbability of any serious counterblow authorized and required the battle ships to take a more or less prominent part in the reduction of the defense, the new facility the defense has acquired of delivering a counterblow will oblige the battleships to remain somewhat in retirement while the work of reducing the defenses will fall more exclusively than in the past upon a land force operating in rear of the sea-coast forts.

The active work of the navy in these joint operations will be by every means possible to prevent the delivery of the counterblow upon the water.

(*Concluded.*)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A PROPOSED NEW HEALTH RECORD.*

By ASSISTANT SURGEON EARLE M. BROWN, U. S. Navy.

If the Bureau of Navigation were to abolish the present system of enlistment records and issue an order that an enlistment journal should thereafter be kept on board every ship and at every station, in a very short time letters would be received from the various commanders-in-chief and commandants respectfully inviting the attention of the bureau to certain objectionable features attending the keeping of such a journal. Chief among these objections would be, that, unless some record accompanied a man upon his various transfers, in the course of his four years of service his enlistment record would become widely scattered and hopelessly confused. Imagine a man, transferred five times during his four years of service, with his record of promotions and punishments carefully recorded on the installment plan on as many different journals. Captain M———, on the Asiatic Station, would know very little about Tom Jones, ordinary seaman, coming to him from the North Atlantic Station, with a memorandum slip that read as follows:

Jones, Thomas, O. S.
Born, July 16, 1880, at Rome, N. Y.
Enlisted, December 1, 1899, at New York, N. Y.
Eyes, brown. Hair, black. Complexion, ruddy.
Enlistment, first.

ENLISTMENT RECORD.

Name of Vessel.	Days on Board.	Punishments.	Commanding Officer.
U. S. S. Minneapolis.....	50	1	....., ...
U. S. S. Olympia.....	400	2	....., ...
U. S. F. S. Kentucky.....	320	0	....., ...,
U. S. S. Albany.....	216	1	....., ...
U. S. S. Vicksburg.....	12	0	....., ...

*Discussion is invited.

If Captain M——— had occasion to investigate the offenses committed by Jones, he would be obliged to obtain his information from the enlistment journals of these various other ships.

Undoubtedly such a system of records would be considered faulty and unsatisfactory, yet practically the same system is now in use, and has been for years, in keeping the health records of enlisted men.

To better illustrate this let us follow out a hypothetical case, and then give the summary as it would appear on the present health record. Robert Thornson, we will say, enlisted as a landsman for training on December 7, 1900, at Savannah, Ga., and, on December 10, 1900, was transferred to the U. S. R. S. Franklin. He was admitted to the sick list with tonsillitis on December 20, 1900. The medical officer on the Franklin, having no record whatsoever of Thornson, was obliged to obtain from the executive officer the enlistment record, and copy in the medical journal the following data:

Thornson, Robert. Landsman for training.
Born, July 4, 1877, at Chester, Pennsylvania.
Enlisted, December 7, 1900, at Savannah, Georgia.

Then the diagnosis and history of the case were appended, stating that the disease originated in the line of duty, and, finally, the prescribed treatment. It takes but a few such admissions to fill a page in the large medical journal. Thornson was discharged to duty on December 25, 1900, and on February 15, 1901, he was transferred to the U. S. S. Prairie. On November 8, 1901, Thornson appeared with a primary lesion of syphilis, and the medical officer admitted him to the list for record only. The data for the journal were obtained from the enlistment record as before. On January 12, 1902, Thornson was admitted to the list with a left inguinal hernia. Since his first admission a new medical journal had been opened, the old journal having been completed and forwarded to the department, hence the medical officer was again obliged to make a complete record in the new journal. Two days later Thornson was transferred to the Naval Hospital, New York, and once again the medical officer made out his record, this time upon a hospital ticket. On the hospital ticket there was also written, from the records taken from the medical journal, a history of the case, in order that the medical officer in charge of the hospital might be furnished with the necessary data in Thornson's

case. Thirteen months had now elapsed since Thornson entered the service. In that time he had been on two ships and in one hospital, but his health record, instead of being with him at the hospital, had become widely scattered, being found in the journal of the Franklin, at Norfolk; in one journal of the Prairie, at Washington; in another journal of the Prairie, then at sea; and in a case paper at the hospital; while his enlistment record was then on the Hancock. Thornson finished his cruise on the Baltimore and was discharged from the service on December 12, 1904. On the last page of his enlistment record was appended in due form his health record, which read as follows:

HEALTH RECORD.

(The terms excellent, very good, good, fair, indifferent, or bad, must be used to indicate state of health.)
(To be entered at date of transfer, discharge, desertion, or death.)

Name of Vessel.	Date of transfer or discharge.	State of health while on board.	Number of days on board.	Number of days on sick list.
U. S. R. S. Franklin....	Feb. 15/01.	Fair.	67	5
U. S. S. Prairie.....	Jan. 14/02.	Good.	333	3
U. S. R. S. Hancock....	May 1/02.	Bad.	107	57
U. S. S. Baltimore.....	Dec. 12/04.	Excellent.	955	0

From a medical standpoint such a record is valueless, and the space it occupies on the enlistment record might be used to far greater advantage for other purposes.

It is not only possible but practicable to have a separate and complete health record, and the following plan is submitted for the perusal and criticism of all who may be interested. The suggested health record should call forth comment and criticism, not only from the medical officers but from the line officers as well, because, should it be adopted by the navy, it would materially lessen the number of professional malingerers as well as the half-sick men, so many of whom now manage to complete their enlistments, but who in no way increase the efficiency of the service. Line officers are all striving in every way possible to increase the efficiency of the navy, and for that reason this article is in part addressed to them.

The proposed health record would be of the same size as the enlistment record, and would accompany the enlistment record at each transfer, the latter going to the executive officer, and the

former to the medical officer, to be filed in their respective offices. The medical officer then has for his immediate use the record of every man on board his ship. Whenever a man appears at sick call, his record is taken from the files, and an entry made of his present condition. Should he be admitted to the list, entries can be made from day to day of the progress of the case, as well as the treatment prescribed.

The suggested record would greatly simplify the medical journal. The name and diagnosis, required in making out statistical reports, are all that would be necessary, because the health record would contain the data, now supplied by the enlistment record, as well as the origin and history of the disease or injury.

When a transfer is made from a ship to a hospital it is at present absolutely necessary to have a hospital ticket accompany the patient, but with the full history of the case recorded on the proposed health record, which would accompany the patient, the hospital ticket would not be required.

Upon the arrival of a patient at the hospital, the medical officer to whom the case is assigned, must now make out a case paper from the data obtained from the hospital ticket, and then from day to day record the history until the patient is discharged, when the case paper is forwarded to the department. If the history were to be written on the proposed health record, the case paper would no longer be necessary.

Syphilis is a disease which requires a long and continued course of treatment for its successful cure. It not infrequently happens that a man under treatment for syphilis on one ship is transferred to another, and almost invariably he thinks it a fine opportunity to free himself from the clutches of the doctor and start with a clear record, so he does not appear for treatment. Just such cases, which are neglected through no fault of the doctor, often terminate badly, and there is very little reason to doubt that many a good man has been lost to the service through this cause. With the suggested health record in use, such a mistake could not well occur, for the medical officer has before him, as soon as a man is transferred to his ship, the entire health record from the time of the man's entry into the service. Some medical officers try to better our health record a little by disregarding the printed instructions on the enlistment record. They write in the column reserved for such words as "Excellent, Very Good, and Fair,"

the name of the disease. This helps a little, but it has one serious objection attached to it. Health records should be strictly confidential, but if diagnoses are boldly written on the backs of the enlistment records, where every yeoman and writer on the ship can read them, they become public property.

Briefly, the advantages to be gained from the proposed health record as as follows:

1. That part of the enlistment record marked health record could be used for other purposes.

2. The medical journal would be reduced to a brief record of admissions, discharges, and those continued on the list, to be used in making out the statistical reports.

3. The health record would do away entirely with the hospital ticket.

4. The hospital case paper would disappear.

5. A complete, continuous, and compact medical history of every man in the service would be secured.

6. Immediately upon the discharge of a man, his record would be sent to Washington to be filed, where it would always be on hand to facilitate the work of the Pension Bureau.

7. The record could be written on the typewriter, thus greatly increasing its legibility and clerical accuracy.

8. It would greatly assist the medical officer in making proper diagnoses in obscure cases, and would facilitate treatment in many cases which would otherwise be neglected.

9. It would assist the medical officer making the examination at the time of discharge as to his recommendation for re-enlistment.

The objection that the records are liable to go astray, may be answered at once. No records are absolutely safe on board ship, but certainly those proposed are no more subject to loss than the enlistment records, which have stood the test of time.

There ought to be a health record for officers, modelled on the above plan, but modified to suit the conditions. Upon entrance to the Naval Academy the usual data should be entered in a small leather covered book, and during the six years as a midshipman, the health record could be kept in it. After passing the physical examination for ensign, the old record could be filed in the department, and a new book issued for the grade of ensign. A new book could be issued in this manner for each grade. Of course these

records would be kept by the medical officer, and would necessarily be confidential. A great many officers take pride in keeping their names off the sick list, but the practice sometimes becomes retroactive, as many a retired officer could testify. The plea for compact and complete records is especially emphasized in the case of officers, because of the great number of years most of them remain in the service. Under our present system, it is quite a task to collect the medical history of an officer who has been in the service for forty years.

The writer again wishes to ask the readers of this article for their criticism, be it adverse or favorable, for by this means only can a decision be reached as to the actual merits of the proposed record, and whether or not it is of sufficient value to warrant its formal submission to the Bureau of Medicine and Surgery.

In closing, I wish to take this opportunity to thank Hospital Steward C. E. Alexander, U. S. N., who is responsible for the form of the descriptive list, and at whose suggestion the duplicate stub was added, so that an accurate carbon copy is made and the stub detached and forwarded to the Bureau of Medicine and Surgery.

DISCUSSION.

Medical Inspector HOWARD E. AMES, U. S. Navy.—The importance of this question is so marked that it deserves the support of every well-wisher of the service. After careful consideration of the paper as a medical officer, I find all my thoughts centered on the one conclusion, that the sooner it is adopted the better for the service, particularly for the medical section. I do not believe any experienced medical officer can logically support the present system that is now used. It is so meager, so misleading, and generally unsatisfactory that one is surprised that it has continued so long.

It is common to see under "Health record" "days on sick list," under the heading "State of Health" while on board, "bad"; which is not correct, for an investigation shows that most of that time the man's sick days were due to an injury—say a fracture or sprain. Some medical officers will add this fact, so many days fracture or sprain. This clears matters somewhat, showing that it was not bad health, but it does not give the origin, whether injury was due to the breaking of a hawser while on duty or was caused by a drunken brawl in which he was thrown from a window. These are important points to know, they show his health, his misfortunes, and his habits.

Daily, hourly, throughout the service all over the world surveys are held on men with a long medical history unobtainable. Medical boards are then obliged to vainly grope in the dark, to find some cogent reason to

HEALTH RECORD

— AND —

DESCRIPTIVE LIST.

Surname, THORNSON,

Christian Names, ROBERT

HEALTH RECORD.

(Upon enlistment of candidate this stub to be detached and forwarded to the Bureau of Medicine and Surgery.)

Name Thornson, Robert *Rate* Landsman for training.

Born July 4, 1877. *At* Chester, Penn.

Name, relationship, and address of next of kin or guardian John Thornson (father)
2871 Harper Street, Baltimore, Md.

Height, 5 *feet* 8 *inches; Weight,* 158 *lbs.; Eyes,* light blue.

Hair light. *Complexion* ruddy.

Personal characteristics, marks and scars, star shaped scar on back of neck;
''R. T.'' on l. f. arm; linear scar over left eye.

Enlisted December 7, 1900. *At* Savannah, Georgia.

Date of first enlistment December 7, 1900. *Holds C. S. C. No.* -----

Date of departure from recruiting rendezvous December 10, 1900.

(Signature of Medical Officer making examination at date of enlistment.)

U. S. NAVAL HOSPITAL, NEW YORK.

January 15, 1902. Careful examination made. The case is operable but must be delayed on account of poor physical condition, due no doubt to the syphilitic invasion.

January 22, 1902. Under specific treatment.

January 29, 1902. Prepared for operation.

January 30, 1902. Halsted operation performed. Wound closed by subcutaneous suture and dressed with silver foil.

January 31, 1902. Temperature 99.8 at 5 a. m., complains of pain in the region of the wound.

February 1, 1902. Temperature 99. Slept well. Complains of slight pain.

February 8, 1902. The first dressings removed. No signs of any infection.

February 15, 1902. Patient out of cot. Spica bandage applied over wound for support.

''D''. March 12, 1902. Discharged to the U. S. R. S. Hancock for duty. Bandage applied as a pre-

bandage applied over wound for support.

''D''. March 12, 1902. Discharged to the U. S. R. S. Hancock for duty. Bandage applied as a precautionary measure.

_____, _____, Medical Director, U. S. N.

U. S. R. S. HANCOCK.

March 14, 1902. Given light duty and a spica bandage applied every other day. Put on potassium iodide.

May 1, 1902. Transferred to the U. S. S. Baltimore.

_____, _____, Medical Inspector, U. S. N.

U. S. S. BALTIMORE.

June 12, 1903. Vaccinated.

December 12, 1904. Examined for discharge at expiration of enlistment. Weight 177 lbs.; additional scars.

Operative, in l. inguinal region. There is now no evidence of syphilis. Recommended, physically, for re-enlistment.

_____, _____, Surgeon, U. S. N.

nomenclature in Form K, must be noted.

U. S. R. S. FRANKLIN.

''A''. December 20, 1900. Tonsillitis-duty-result of exposure to prevailing epidemic. Tr. Iodi applied to the tonsils followed by eucalyptus spray.

December 23, 1900. Under same treatment. Much Improved.

''D''. December 25, 1900. Discharged to duty, well.

February 15, 1901. Transferred to U. S. S. PRAIRIE.

_____, _____, Surgeon, U. S. N.

U. S. S. PRAIRIE.

February 21, 1901. Vaccinated.

''A.D''. November 8, 1901. Syphilis-not duty-venereal in origin. Primary lesion on fraenum. Calomel dressing.

December 5,1901. Put on specific treatment for syphilis.

''A'' January 12, 1902. Hernia (left inguinal)-duty-caused by falling down an unguarded hatch. Hernia reduced and a close fitting spica bandage applied.

''H''. January 14, 1902. Transferred to the U. S. Naval Hospital, New York.

_____, _____, Surgeon, U. S. N.

HEALTH RECORD.

(Must accompany the man during enlistment, and be forwarded to the Bureau of Medicine and Surgery upon discharge, death or desertion.)

Name Thornson, Robert *Rate* Landsman for training.

Born July 4, 1877. *At* Chester, Penn.

Name, relationship, and address of next of kin or guardian John Thornson (father)
2871 Harper Street, Baltimore, Md.

Height, 5 *feet* 8 *inches; Weight,* 158 *lbs.; Eyes,* light blue.

Hair, light. *Complexion* ruddy.

Personal characteristics, marks and scars, star shaped scar on back of neck;
''R. T.'' on l. f. arm; linear scar over left eye.

Enlisted December 7, 1900. *At* Savannah, Georgia.

Date of first enlistment December 7, 1900. *Holds C. S. C. No.* -----

Date of departure from recruiting rendezvous December 10, 1900.

(Signature of Medical Officer making examination at date of enlistment.)

INSTRUCTIONS:

Name of ship, date of transfer, number of days on board, number of days on sick-list and signature of Medical Officer, must accompany each case of transfer.

In each case of admission to sick-list, date of admission and discharge with full description of case and name used in nomenclature in Form K, must be noted.

U. S. R. S. FRANKLIN.

''A''. December 20, 1900. Tonsillitis-duty-result of exposure

SUMMARY OF CRUISE.

NAME OF VESSEL OR STATION.	NUMBER OF DAYS ON BOARD.	NUMBER OF DAYS ON SICK-LIST.	SIGNATURE OF MEDICAL OFFICER.
Savannah, Ga.	3	0	
U. S. R. S. Franklin.	67	5	
U. S. S. Prairie.	333	3	
U. S. N. Hosp. N. Y.	57	57	
U. S. R. S. Hancock.	50	0	
U. S. S. Baltimore.	660	0	

guide them in their findings; the absence of the medical history of the man or officer leaves you stranded. You cannot expect the patient to help you throw light upon his condition, particularly if it is against him. How annoying to afterwards have some brother officer, who knew the patient's previous history, smilingly inform you how cleverly the patient worked the board. Of course, we can insert a saving clause, "In absence of medical history," and "According to patient's statement," etc., etc. These (justly) protect the medical board, but how about the service personnel? In many, many cases it suffers.

This medical history and health record would show up the unworthy and rid the service of many dead beats. It will be of great value in not only expediting the transfer of cases, but save an immense amount of useless work, as the author points out, in the doing away with the hospital tickets, and abolishing that useless and laborious grind of making out the case papers in our hospitals. Any change that can eliminate or reduce the immense amount of paper work in the service should be encouraged, and, I feel, would be hailed with delight.

What a boon it would be to the bureau in hunting up pension cases! what a saving to the Government in money and time to have at hand the whole medical history (as they would be filed together for the individual's life career in the navy). Now, it is a laborious job to get the abstracts from the numerous medical journals of the ships the man has served.

I ask indulgence in submitting the following extract from my annual report of the Naval Academy; as it was not printed in the Surgeon-General's Report, it will be at least new reading. It is painful reading but absolutely true. As it covers the ground fairly well and bears so directly upon Assistant Surgeon Earl Brown's papers, I beg that it be printed:

"The law is explicit regarding physical soundness but these mandatory statutes are constantly being violated; no doubt unintentionally, but the fact remains that we are not sustained in our findings; and year after year, waivers are issued that cover almost every kind of physical defect. This leads to future complications which I will endeavor to crudely indicate.

"In recommending the rejected candidate for continuance for two years in the service after leaving the Academy, I respectfully call attention to the probabilities of his being continued after that time. This is due to the fact that the physical record of the midshipman has always been kept at the Academy. Now, the four years' graduate leaves the institution, and all his physical and medical records are left behind him. No matter what his record, whether he be rejected or not, nothing is placed before the medical board at his final graduating examination.

"We know, from experience, that the examinations on foreign stations and on ships are not of that rigid character that they should be. This is largely due (I frankly admit in my own experience) to a false assumption that he was physically sound when he left the naval school. There is nothing to guide the board in judging of the previous condition and, as a rule, a favorable report is made. We further know that a notice of the acceptance of the candidate is noted at the Navy Department; and rarely indeed are inquiries made beyond this last return, and the party is continued.

"Then it is often the fact that the physically defective person rejected from the first entrance into the school to the present moment, is continued in the service. To overcome this serious defect, I would suggest that a full report of the scholastic officer be sent to every station or ship to which he may be assigned, with instructions that a careful medical history with the dental record, be attached to his original academy record to be laid before the Medical and Mental Examining Board, to guide them in estimating the worthiness of the candidate for continuance in the service.

"This break in the medical record did not exist prior to the year 1899. Since that time, the records have been incomplete; beyond the department's notice that the candidate has passed. It is apparent that this error is far reaching. The medical record of an officer begins at the time he begins his official career, at the time of his final graduation. It is then the medical journal of the department begins. We then enter 'in line' or 'not in line of duty.' The breakdows or troubles that invalid him or put him on the retired list, may have originated prior to this time, back to his original appearance for entry into the academy; but such evidence is not consulted; it lies buried in the forgotten records of this institution. The subjoined list will give an idea. The names are omitted but the fact remains indisputable. In some cases several defects existed in the same individual, any one sufficient to reject, but all were passed. Further comment is unnecessary.

"List of rejections occurring during the past five years, from 1898 to 1903, in which the defects have been waived, and the parties retained in the service:

Cause of rejection.	*No. of cases.*
Heart disease	17
Defective vision	22
Defective hearing	10
Poor development	8
Undersize	3
Varicocele	3
Enlarged tonsils	3
Deformity and poor development	2
Defective teeth	2
Underheight	1
Kidney disease	1
Hemorrhoids	1
Enlarged testicle	1
Deformity and lateral curvature	1
Defective speech	1
Total number of rejections	76

"Note: The above represents 63 individual cases—13 were rejected for more than one disqualification."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AIMING BY TELESCOPE SIGHT COMPARED WITH AIMING BY OPEN SIGHTS.

A PHYSICO-PHYSIOLOGICAL STUDY.

By Dr. S. Crapski, Jena, Germany.

(*Translated by Capt. A. E. Piorkowski, I. G. A.*)

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Recent publications on telescope sights, advantages claimed for their use, cause of these advantages.

(Alger; American and English Handbooks of Telescope-Sights; Von Kodar; Korzen).

The *essential* difference between open sights and telescopic ones usually stated correctly but not exhaustively. No measurements given, except by Von Kretschmar, who indicates two separate sources of error

Theme of the discussion; definition of the problem.

FIRST PART:

Uncertainty in aiming caused by the differences in distance of target, fore sight, and rear sight from the eye.

Mathematical computation of dimness of extrafocal (nonfocused) objects in the plane of those seen distinct.

Photographic demonstration of the image of target and sighting apparatus with the eye focused on different distances. Image when aiming by telescope (or Grubb sight).

SECOND PART:

The *error in direction* caused by peculiarities of the human eye.

Peculiarity of the human eye in comparison with photographic camera. Scope of the eye.

Observations in regard to error in direction.

(Von Kretschmar's experiences with gunners; appearance of the moon's crescent; Helmholtz's and Röntgen's experiments).
Explanation of these experiences by the irregular astigmatism of the eye.
Definition of the difference between anastigmatic, regular, and irregular astigmatic vision.
Source of the latter appearance the construction of the crystal lens.
Influence on the vision of focused and non-focused objects.
Perception of non-focused objects improved by simultaneous error in localisation.
Application to the aiming with open sights, or telescope sights, or Grubb sight.

CONCLUSIONS:

Modern telescope sights.
Field of vision and brightness in modern telescope sights (illumination at night, magnifying power).
Influence of range of target on the parallax in the telescope.
Parallax, field of vision, position of the eyes with the Grubb-sight.
Qualities of the prominent systems of prisms.
The question of keeping the sight line constant.

The advantages gained by the use of telescopes in aiming and laying guns have recently and repeatedly been the object of discussion, even before the general public.

P. R. Alger, Professor of Mathematics, United States Navy, strongly urges their application to naval ordnance, in a lecture before the U. S. Naval College, Newport, R. I., published in the PROCEEDINGS OF U. S. NAVAL INSTITUTE, 1897, XXIII, pages 125 to 140, and which contains a wealth of interesting remarks. In accordance with this the American "Handbook of Telescopic Sights" (Washington, 1899) expresses itself decidedly in favor of advantages reached by the adoption of telescopes, and so does the English "Handbook for Telescopic Sights, Land Service" (London, 1901). More recently E. von Kodar, 2d Class Naval Engineer, Austrian Navy, gave a lecture on this subject in the "Marine-wissenschaftlichen Verein" at Pola (published in "Mitteilungen aus dem Gebiete des Seewesens," Vol. XXXI, No. IX, August, 15, 1903, pages 713 to 734), where the characteristic peculiarities of construction and efficacy of telescope sights is clearly and accurately shown, with the exception of some inaccuracies which shall be mentioned later. This work also is highly in favor of the telescope.

Anton Korzen, engineer of artillery, Austrian navy, and teacher in the War College, in his valuable memoir on Die Richtmittel der Geschütze in "Mitteilungen über Gegenstände des Artillerie- und Geniewesens," Nos. 5, 6 and 11, pronounces his opinion in a similar way in the chapter on telescopic sights.

After reading Korzen, however, it might be believed that the specific advantage in using telescope sights was the magnifying effect, as if the aiming by telescope could only be improved in proportion to its magnifying power. This is a very general mistake—may it be stated right here—the correction of which is the chief object of the following pages. The *specific advantage in using telescopic sights is quite a different one, and is gained even if there is no magnifying at all.* It is, indeed, a matter of free choice, to be decided on the ground of special argument, if a telescope for sighting shall have magnifying effect, and how much of it. With geodetic work, for example, non-magnifying telescopes are much in use, and very satisfactory.

In Alger's and Von Kodar's publications this specific argument is also more or less clearly given (indirectly also in the handbooks mentioned). So Alger says (page 125):

"It has long been recognized by those who have investigated the subject that it is physically impossible for the human eye to judge when three points at widely different distances are in one straight line." And Von Kodar (page 715) states even more pointedly: "There is no doubt that this method of aiming (*i. e.*, with open sights) would be very perfect if the qualities of our eye would not make it impossible to simultaneously align three points situated at different distances. Everybody knows that in looking at a distant object our eye automatically accommodates itself to the long distance and then objects nearer us are only dimly visible, and vice versa. *Therefore it is quite out of question for the eye to simultaneously and distinctly perceive the rear sight, quite near the eye, the fore sight, a small distance off, and the far-away target.*"

This is the one argument clearly put against aiming with open sights, and further on it is also explained how by using telescopes (or the Grubb sight) the said errors are avoided.

But Von Kodar does not enter into discussing the *amount of error* to be expected in aiming with open sights. He is satisfied by characterizing the *quality* without determining the

quantity of the error. In all the publications on the subject, known to the author, the only computation of an error in aiming is that of the difference in elevation by aiming with "fine sight" or "full sight" or "half sight," in the monograph by Colonel von Kretschmar on his level sight, July, 1890, of which a very abridged extract came out first in General R. Wille's book, "Das Feldgeschutz der Zukunft," Berlin, 1891, pages 253 to 256, and later, repeated in part, unfortunately not textually, in the same author's book, "Fried. Krupps Schnellfeuerkanone C/99," Berlin, 1900, pages 68 to 71. (From there it was taken into the discussion of Korzen's article, by Captain Wangemann, quite recently in Kriegstechnische Zeitschrift, VIIth year, 1904, pages 158 to 160.)

In Von Kretschmar's monograph, the original text of which he kindly lent to the author, there are remarks which, though short, seem to strike the true core of the matter. These remarks, according to Von Kretschmar, are founded on "observations made in actual shooting of four batteries in two years' courses and verified by the target reports." Von Kretschmar says (page 1 of his monograph): "Uniform and satisfactory aiming can only be obtained, if the apparatus for aiming attached to the gun furnishes the requirements and will not itself cause inaccurate and uneven aiming. The latter will and must be the case with all sighting apparatus allowing to the individuality and unreliability of the gunner a certain influence on the accuracy of every single aiming." Probably the authors of the American and the English handbook had something similar in mind when they described "the *diminution or elimination* of the personal error" as one of the advantages of telescopic sights.

Looking at these conditions somewhat closer shows that the problem consists in the discussion of and answer to two questions of widely differing character but equal importance for the practice, viz.:

1st. What *uncertainty* (inaccuracy) results with open sights from the fact that the human eye is unable to perceive at the same moment distinctly the sights and the target? and

2d. Are there factors in the human eye which, in aiming with open sights (*i. e.*, looking simultaneously at objects at different distances), will produce a *regular one-sided error* as to *direction of vision?*

The difference in meaning of these questions is evident, considering that *uncertainty* may to a certain degree diminish through practice; but one-sided error in the eye will, through such practice, only be recognized more clearly, as is well known from the practice of astronomical and other art of measuring.

In the present case—not by far in all cases—it is very fortunate that the same means which relieves the *uncertainty* also eliminates the *personal one-sided* error.

I. UNCERTAINTY IN AIMING AS A CONSEQUENCE OF THE DIFFERENCE IN DISTANCE OF REAR SIGHT, FORE SIGHT AND TARGET FROM THE EYE.

It is easy to calculate the amount of this uncertainty.

A being a section through the middle (P) of the pupil ($P'P''$) of the human eye focused and aiming at the target (Z). Distinct

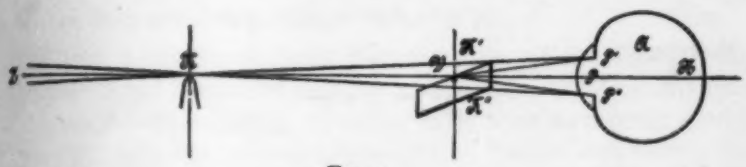


FIG. 1.

images on the retina will then appear only of objects near the target, *i. e.*, relatively very distant objects. Points at closer range, for example the top of the fore sight, will give indistinct images. Instead of calculating how these are shaped on the retina it is simpler and more practical to find out how such indistinct images *appear to the observer.* Of course he perceives them as *projected on* the plane to which his eye is focused, and every point of the objects in the "extrafocal" plane as a "dispersion circle," a dim small disc whose center is in the connecting line of the object point and the middle of the pupil, or its prolongation, and whose circumference is determined by the *geometrical projection of the pupil on the focused plane, the object point as center of projection.* So, if the top of the foresight (K) is connected with the rim of the pupil by lines KP' and KP'' and these lines prolonged beyond K to the distant plane of the target, their dispersion there will show the size of the little disc representing the top end of K as it appears in an eye focused on the target.

This determination holds good in every sense. It gives in exactly the same manner the dispersion circle (disc) for every point of the rear sight as it appears in the plane of the target; also the dispersion images of target and rear sight, in an eye focused on the fore sight, and those of the target and fore sight in an eye focused on the rear sight. In the following the three cases, in which the eye is focused on target, fore sight and rear sight, will be called (a), (b), (c) respectively.

For instance, the same drawing which in case (a) gives the dispersion figure of K in the plane of the target, serves in case (c) to give the dispersion figure of K in the plane of the rear sight (V). The intersection of lines KP' and KP'' with the vertical plane through V outlines the dispersion image of K when the eye is focused on V.

Size and shape of the dispersion figures are then easily computed. In the similar triangles $KP'P''$ and $KK'K''$ is

$$K'K'' : P'P'' = KV : KP$$

therefore

$$K'K'' = P'P'' \frac{KV}{KP} \tag{1}$$

The diameter ($K'K''$) of the dispersion figure $= Z$ (if the figure is not circular, Z means its diameter in the particular meridian), the diameter of the opening of the pupil ($P'P''$)$= p$, the distance between the eye and the distinctly seen object (VP) $= d$, the distance of the dimly seen object whose dispersion figure is in question from the other (KV) $= a$; the last equation then is to be written:

$$Z = p \frac{a}{a + d} \tag{1a}$$

or in case the distance of the dimly seen object from the eye (KP)$= e$

$$Z = p \frac{a}{e} \tag{1b}$$

This equation means, what is evident, that the dispersion figure of a dimly seen point in the plane of distinct seeing grows in direct proportion with the diameter of the pupil of the observer's eye, and the distance between the dimly seen and the clearly seen

object, and in inverse proportion with the distance of the dimly seen object from the eye.

Assuming, for instance, an opening of 3 mm. of the pupil—as normal when looking at a landscape of average brightness—assuming further that the eye was focused on the point of the fore sight that the length of the sight line be 1000 mm. and the distance between rear sight and eye 200 mm., then the dispersion circle of every point of the rear sight will have a diameter in the plane of the fore sight

$$Z_{200} = 3 \cdot \frac{1000}{200} = 15 \text{ mm.}$$

Moving the eye to 300 mm. from the rear sight, makes

$$Z_{300} = 10 \text{ mm.}$$

or to 500 mm.

$$Z_{500} = 6 \text{ mm.}$$

Z even then remaining considerable.

It may justly be objected that the parts of the sighting apparatus do not consist of separate points, being solid objects, and that the dispersion circles, covering each other to a great extent, will make a relatively clear impression on the eye with only indistinct outlines. This is correct and is easily proved by using the above equation for all points in succession. It is preferable instead of such calculation, to show to the reader its visible result by *photographic* representation.

For this purpose an artificial eye has been used, whose pupil opening could be adjusted to an accurately defined size, and whose retina is replaced by photographic plates, in other words, instead of the eye a *camera*[1] was used. With this artificial eye photographs were taken of a sighting apparatus, which the Krupp

[1] As our eye focusses itself for different ranges by means of a change in the refracting mediums, without changing the distance of the retina, so in the camera photographic lenses of suitably different focus distance were used to obtain always the same size of the image. These pictures were made under the author's direction in the photographic laboratory of the firm of Carl Zeiss at Jena by the superintendent of that laboratory, Herr R. Schüttauf with greatest care and ingenuity.

The printed reproductions do not show the difference in distinctness as clearly as the original photographs, but they show enough of it to demonstrate the conditions.

Company in Essen, through Colonel von Kretschmar, lent to the author, and in which an open sight with cross-wires and another with a notch could alternately be put at exactly 1 m. distance from the point of the fore sight.

This instrument was aimed at an object, about 1000 meters away (spire of the "Landgrave House" near Jena) and photographs were taken with different focusing of the artificial eye—on the target, the fore sight and the rear sight—and with different pupil openings—2, 3, 4 mm. The photographs were made under a covered sky to avoid a one-sided illumination of the sights, and they have been reproduced in the following illustrations of such

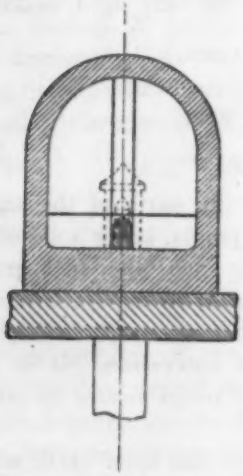


FIG. 2.

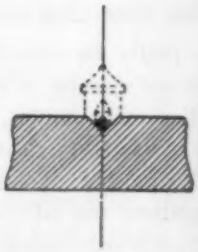


FIG. 3.

size that *seen from a distance of 220 mm. they will give the same impression regarding the relative size of the objects represented, as when observed by the eye of the pointer.* The illustrations show only the pictures obtained with 3 mm. pupil opening focused on target, fore sight and rear sight, for a notch sight and for a cross-wires sight. For comparison the drawing has been added by which aiming with an open sight is usually explained (Figs. 2 and 3). These illustrations, whose truth to nature is guaranteed, speak a language more eloquent than words.

Involuntarily the question arises, how is it possible to produce from such images, such visions, a direction of sight as distinct and accurate as actually obtained.

The following photographs show a cross-wire sight and a notch sight, as it appears to the human eye, when focused (*a*) on the target, (*b*) on the fore sight, (*c*) on the wires or the notch.

When the photographs were taken the distances of the notch or wires were:

From the (artificial) eye,	220 mm.
" " fore sight,	1000 mm.
" " target,	925 m.

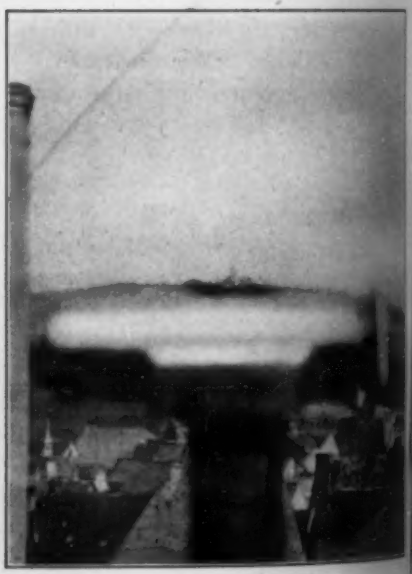
Next to these the image appearing in a telescope sight is shown, in the upper picture (*d*) with an enlargement = 3, in the lower (*d'*) with an enlargement = 1.

The opening of the pupil of the artificial eye was 3 mm.

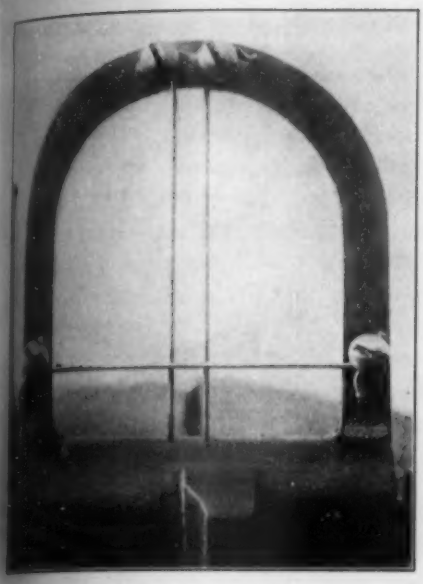
a

b

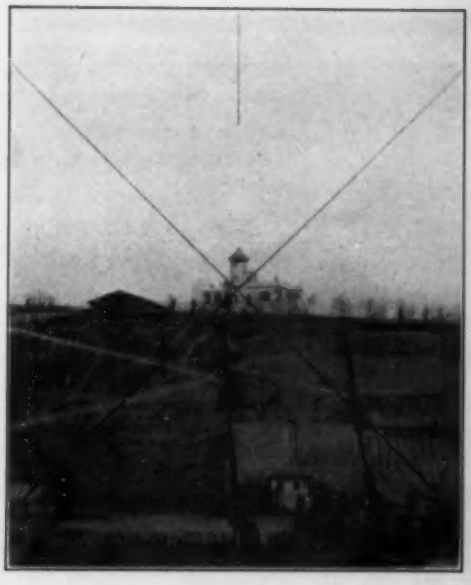
a^1



b^1



c



d

c¹

d¹

Two possibilities seem plausible. Either our eye focuses itself in rapid *succession* on target, fore sight and rear sight, and by comparing the *remembered* perceptions forms a judgment as to the direction; or our eye in aiming uses none of the pictures here shown, but unconsciously focuses itself on a *mean distance* between target and fore sight, at which the inaccuracies of all three of them is best equalized. It would be hard to find out which of these possibilities is the true cause.

In a correctly focused telescope, target, fore sight and rear sight are projected into the same plane. In the focus plane of the objective glass appears a sharp image of the target and is seen there together with the sharp image of the cross-wires through the magnifying ocular lens. Fig. d on the plate shows a photograph of these images as seen in a Krupp-Zeiss telescopic sight magnifying three times. d′ is a picture of the same target as it appears in a telescope without magnification.

In Grubb's sighting apparatus, not the real image of the target is projected on a real cross, but, on the contrary, the virtual image of a real cross is projected on the target remaining in the distance; and through a semi-transparent, semi-reflectant glass plate they are simultaneously presented to the pointer's armed or unarmed eye. The appearance as to the distinctness is the same as in a telescope, only the cross is bright, and there is no enlargement for the naked eye. The above leaves no doubt any longer that aiming with either of these sighting apparatus is far superior to aiming with open sights. (The relative advantages and disadvantages of the Grubb apparatus and the Krupp-Zeiss telescopic sight do not enter the subject of the present article.)

II. The Error in the Direction of Aiming Caused by the Peculiarities of the Human Eye.

The peculiarities of the human eye as an organic apparatus have been ignored until now. In this theoretical deduction of the relative measures it has been assumed that our eye is a perfect optical instrument, and accordingly optical instruments as perfect as at present obtainable have been used for graphic demonstration. In this way have been found the *typical* and general qualities of the phenomena under discussion, but not yet the particulars depending on the *peculiarities* of that special instrument, the human eye, which has to be used.

It may perhaps be claimed as the most general peculiarity of all human organs, or all organic apparatus, that though their special object is often reached in an admirable and marvellous way, they are suited for this only and no more. Their structure and functions, fit for their special purpose and just sufficient for it, does rarely satisfy further claims lying beyond their task.

Now the human eye is justly lauded and admired for its marvellous aptitude for the perception of visible phenomena. Taking this ability in its totality, nobody could think of artificially producing such an organ. But in its particulars certain defects are discovered which are avoided, even easily avoided, in an artificial apparatus. *Helmholtz*, on the basis of his own subtle investigations and those of earlier scholars, has stated that the refracting surfaces of the optical apparatus in our eyes are not perfectly spherical, not even parts of accurate rotation surfaces, that their axes do not coincide among themselves and with those of the diaphragms or with the line of vision, and that the entire composition of this optical apparatus does not satisfy those fundamental requirements as to the production of the image which are fulfilled by every artificial instrument (compensation of the chromatic and spherical inaccuracies of the image, and so forth).

Generally, *i. e.*, with sound normal eyes, these deviations remain within such limits, or compensate each other so favorably, that the task of our eye, viz., the perception of outside objects as visible phenomena, is reached in the satisfactory manner known to everybody. But *the simultaneous perception of objects placed one behind the other in different ranges from the eye, as demanded in aiming, is beyond that task.* Our eye is "not suited" for this purpose. Only by successive accommodation (focusing) on the several objects will our eye furnish us images of satisfactory sharpness without exertion and in rapid succession. Inaccurate pictures, consisting of dispersion circles, of objects on which our eye is not focused, aside from that inaccuracy, are possessed of certain *specific defects* which will occasionally be fatal to correct aiming, by one-sided errors in direction.

Before discussing the cause of this phenomenon, some facts must be stated, which in part are known to everybody, and in part can be easily experienced. As a most important fact, directly concerning our theme, is to be mentioned, what Colonel von Kretschmar states as a result of his observations on the shooting

range, viz., that there are pointers who always, *i. e.*, with every gun, whatever its aiming apparatus and its eventual inaccuracies may be, make an error in direction to one side. (An individual error in elevation can, of course, not be verified because of the possibility of using an open sight with a notch, at "full sight" or "fine sight" instead of "half sight.")

Furthermore, every nearsighted or very farsighted person knows that the moon's crescent, which ought theoretically to appear as *one* indistinct semicircle, is seen instead as an aggregation of several relatively clear semicircles displaced to right and left.

Simpler still, and therefore more convincing, is the result of a test which *Helmholtz* describes in his "Physiological Optics" (2d edition, Hamburg and Leipzig, 1885 to 1896, page 170), and which everybody may easily repeat: make a pinhole in a black

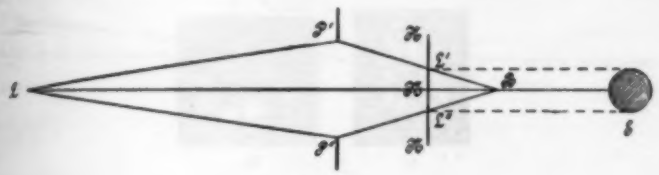


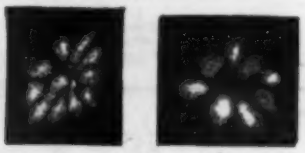
FIG. 4.

cardboard and in a dark room hold it against a bright light at such distance from your eye that it cannot be seen distinctly; if nearsighted hold the card further away than your range of clear seeing; if farsighted approach it below that range; if normal make your eye artificially nearsighted by using a convex lens of several dioptries ($f = 200$ to 400 mm.; objectives of opera-glasses usually have a convexity of 5 to 7 dioptries) and proceed as if nearsighted.

The theory of this experiment for a perfect optical instrument (photographic camera) is very simple; instead of the pinhole there ought to appear a smaller or larger disc of even brightness. In fact, as the picture (B) (Fig. 4) of a luminous point (L) appears before or beyond the sensitive plane ($N\,N$) (Retina, dulled glass, photographic plate) a dispersion figure ($L'\,L''$) will appear on it, resembling in all parts the opening in the screen (pupil, diaphragm), and whose dimensions are in direct proportion to the focal difference ($N\,B$) and the size of the opening ($P'\,P''$)

in just the same way as shown above for the appearance of the fore and rear sights. As our pupil is approximately circular, we would be justified in expecting to perceive a small equally bright disc (*E*). We see this whenever we take a photographic camera with a *reasonably* good objective in place of the eye. Our eye itself, however, shows something different, varying from one individual to another and also from one eye to the other in the same individual. Helmholtz draws it for his left eye, as in fig. 5.

Fig. 5a, being the appearance with eye focused on a near object, Fig. 5b, with eye focused on a more distant one. Instead of the little disc of even brightness there appear several (usually 4 to 8) smaller ones grouped more or less symmetrically round a central one. The axes of symmetry of the figure differ with different persons, and are at different angles with the horizontal and vertical. The several luminous discs or specks show more or less



a. b.

FIG. 5.

of a tail. "As long as the light is faint, we see only the brightest parts of the phenomenon, and several images of the brightest point, one of them appearing brighter than the others. On the other hand, in case the light is very strong, for example, where direct sunlight falls through the pinhole, the rays of the star will flow together, and all around will appear a crown, much larger, of countless very fine lines in all colors." (*Helmholtz.*) (Anybody who should find it difficult to observe this phenomenon, which is beyond his range of accurate sight, ought to "glare" or look at it half dreamily. Otherwise desperate attempts of the eyes will ensue to see the cardboard clear, often causing pain and in all cases failing.)

As a third demonstration will serve the experiment, which W. C. Röntgen described in 1894 (Wiedemann's "Ann. der Physik und Chemie," N. F., Vol. 52, pages 589-92). Take an angular mirror of exactly 90 degrees with faces well meeting, *i. e.*, with a very narrow, yet not quite disappearing edge (*K*) (Fig. 6). It

will be best to use a good right-angle glass prism, through whose hypotenuse surface (H), one looks towards its side surfaces (W' W'') which act as mirrors with total reflection. The observer then sees his own eye and at first thinks it is a simple reflection, but on closer examination he finds that right and left are not reversed as in a mirror, but that he sees its *correct* image only turned around (K) by 180 degrees. It is easily understood that every point of the image is obtained by drawing a line at right angles from the object point to the edge K and doubling its length; in this way points P_1 P P_2 of the pupil are pictured in P_1' P' P_2'.

The edge (K) of the angular mirror remains as a real object steady between the pupil and its image, independent of eventual movements of the eye sideways or forward and back, always exactly in the middle between pupil and image, and also exactly in

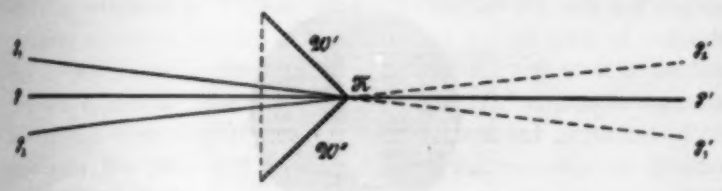


FIG. 6.

the plane through both—the horizontal middle plane when the edge is held horizontal, the vertical, when vertical.

These peculiar relations, absolutely accurate, make this experiment well suited to explain the theory of aiming. The analogy is apparent; the edge represents the fore sight which, from the fixed position of the eye, is projected on the reflected image of the eye representing the target. Again, it is easily computed how the edge *ought* to appear were the image of the eye seen distinctly, and how the image is seen in fact when in place of the human eye a camera is used in the experiment: Instead of a sharp (supposing it is bright) a diffused broad band would spread over the picture of the pupil, of uniform dim brightness and just as wide as the picture, exactly covering it.

Fig. 7 is the reproduction of such a picture as produced on the sensitive plate by a photographic objective. Again the appearance in the eye is quite different; instead of one *band* of diffused brightness several more or less clear *lines* parallel to each other are seen, one of them, brighter than the others, absorbing

usually the observer's attention, who, neglecting the others, takes this one for the only picture of the mirror's edge.

Now it ought to be expected for theoretical reasons that this prominent picture of the edge would *exactly halve* the picture of the pupil, horizontally or vertically, as the angular mirror may be held. This is, however, as Röntgen states, *generally not so.* With some persons the vertical line is nearer the nose, with others nearer the temples; the horizontal with some persons is too high up, with others too low down. This deviation is stated as of different size by different persons, and undoubtedly perceived so. With some persons the anomaly is nil. This test by Röntgen furnishes an excellent explanation of the theory of aiming by fore and rear sights, the conditions of the test being especially simple and to be determined with absolute accuracy and not to be dis-

FIG. 7.

turbed. No kind of carelessness or lack of attention can influence the accuracy of the test; the angular mirror automatically corrects the conditions and even an inaccuracy in its angle (more or less than 90 degrees) will only make the *observation* slightly *more difficult,* but will not diminish its *accuracy.*

The *explanation* of *Röntgen's experiment*—which its originator sought in vain[2]—is, the author thinks, to be derived without

[2] Röntgen explains the phenomenon by what Helmholtz states as a deviation of the "line of vision" from the axis of the eye. This explanation, however, seems to differ from Helmholtz's own theory of aiming, the résumé of which reads (Helmholtz, page 127): "The ray which touches the center of the dispersion circle runs . . . . in the anterior chamber, in fact through the center of the pupil, and *prolonged in the air through the center of the image of the cornea of the pupil.*" But that image of the pupil is just the one we see from outside, so we must see it divided into equal halves, in spite of the deviation of the "line of sight." Röntgen's experiment is identical with that which Helmholtz himself described in connection with the one mentioned above, where he uses a narrow slit instead of the pinhole for his object.

difficulty and is perfectly consistent with and similar to that of Helmholtz's experiment from the so-called "*irregular astigmatism*" of the eye. The edge of the angular mirror is nothing but a linear repetition of Helmholtz's pinhole, the phenomenon in the one case only an integration of the one in the other.

The phenomena of "regular astigmatism" or simply "astigmatism," of the eye as well as of artificial optical apparatus, are well known. With our eye they are shown most conspicuously in that the rays of a star-shaped figure ★ do not appear equally sharp; one direction is specially favored, the one at right angles to it specially neglected. A change of the state of focusing of the eye makes these main directions or "meridians of astigmatism" reverse their parts: the meridian dimmest before changes into the clearest, and vice versa. The cause for this is that the refracting surfaces of the eye, especially the cornea, are not regular rotation surfaces around the axis of the eye as axis of rotation, but in one meridian have a greatest and normal to it a smallest curvature, like a rotation surface, say an egg of plastic material, which has been slightly deformed by one-sided pressure. Consequently the rays will meet sooner in the meridian of greatest curvature than in that of the smallest. Such an eye, strictly speaking, receives two images of every point (which explains the term "astigmatism," from *α* and *στιγμα*, literally "pointlessness.") Practically every eye is astigmatic in a small degree, because the refracting surfaces are in no eye perfect rotation surfaces. But astigmatism of less than one-half dioptry is hardly perceptible and oculists do not consider it as pathological.

Irregular astigmatism does not consist in a regular systematic deformation of the refracting surfaces in the eye, like an egg under one-sided pressure—mathematically speaking a three-axed ellipsoid—but in a relatively irregular one, producing accordingly a "scattering" of the rays which form the image, into several bunches more or less separate from each other. On close examination the crystal lens of the human eye shows a peculiar texture and condition of its surface (Fig. 8). While the cause for regular astigmatism is found nearly exclusively in the cornea, the texture of the crystal lens causes the irregular astigmatism.

The crystal lens does not descend uniformly from its center, but there are, so to say, hill ranges, six in number, separated by as many valleys—very shallow ones of course—running radially

from it. These hills and valleys are not even quite smooth like well-polished glass lenses, but show fine grooves, the lens consisting of fine fibres. It is evident that every lack of uniformity in the shape of texture must result in adequate irregularity of the image. And so even an excellent eye will not perceive a bright star as one point of light, but with "tails," as a center of nimbus of rays; wherefrom we derive our definition of the word "star" and "star-shaped." With regard to these conditions, Helmholtz, whose thoughtfulness in judgment is as much beyond suspicion as his authority, made the statement, grown famous since and

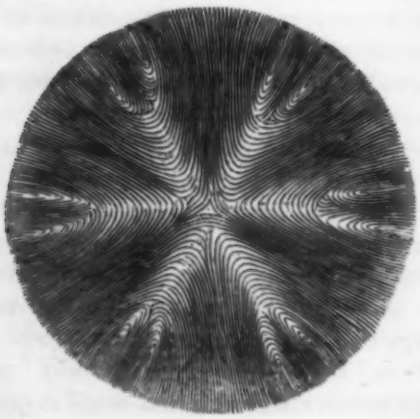


FIG. 8.

often quoted (Cfr. "Die neueren Fortschritte in der Theorie des Sehens," Preuss. Jahrb., 1868, reprinted in "Vorträge und Reden von H. Helmholtz"): "Now it is not saying too much, that dealing with an optician who would try to sell me an instrument having the last-named imperfections, I should believe myself perfectly justified in using the strongest words as to the negligence of his work and in refusing to accept his work."

Helmholtz adds prudently: "Concerning my own eyes, of course, I should not act that way, but on the contrary be glad to keep them with all their shortcomings as long as possible. But the fact that though defective they cannot be exchanged for better ones, evidently does not diminish the amount of what from the viewpoint, one-sided but justifiable, of the optician, we must call their defects."

With less marked objects, not standing out as bright and isolated on a dark background as the stars, the irregular astigmatism does not interfere with distinct perception and localisation, *i. e.*, with the task of the eye, *as long as it is well focused on these objects*—either by the natural accommodation of the eye, or by the assistance of spectacles. However, in such cases where an object, on which the eye has not been focused, must still be observed, as in the above experiments of Helmholtz and Röntgen, and especially the "experiment" of *aiming with fore and rear sights*, the effect of irregular astigmatism is fully recognized and changes the normal character of the result. A bundle of rays emanating from a luminous point, in the shape of a cone, because entering the eye through the circular pupil, will if "stigmatic," or as called in optotechnics "anastigmatic," unite after refraction in one point, the focus. When caught before its union upon a screen, wherever the screen is placed will mark a regular, uniformly illuminated circle. The same bundle deformed by *irregular* astigmatism (as long as not at the same time influenced by regular astigmatism) will in general also unite in *one* image-point, the focus (F). But caught before or beyond the focus it shows an irregularly shaped and unequally illuminated figure. This dispersion, not being regular and uniform around the center, produces an irregular effect, varying from person to person. Sometimes it is one part of the bundle, sometimes another, which prevails in the final effect, often none of them, so that the strongest illumination will remain in the center.

The perception of objects on which the eye is not focused is often facilitated by irregular astigmatism. If the object consists of lines, wire et sim., the effect of the single secondary images of each point will accumulate so that several full images will appear—the moon's crescent, the mirror edge with Röntgen's experiment—and if one is found among these predominating in brightness and clearness, *that* one will be perceived as *the* image of the insufficiently focused object, and all the others ignored. In this way a much more distinct and clearer impression is obtained than from an image consisting of equally dim dispersion circles. Perhaps this might be considered by some as a "useful defect" of our optic. But the reverse of this usefulness lying too near, the distinctness of perception is to be paid for by more or less of an *error in localisation*, unless, so to say by accident, the

prevailing picture lies in the "optical center of gravity" of the bundle of rays. Such is undeniably proved by the Röntgen experiment.

The mere fact that dimly seen points will not appear in the center of their geometrical dispersion circle does not yet constitute an error in the direction of aiming. For, if a lateral movement would affect all objects in the line of vision uniformly (*i. e.*, by an equal value of angle), the foundation of the usual theory of aiming would remain, viz., that 3 points lying actually in the same line would so appear to an eye in the prolongation of that line. The direction of vision only would be slightly altered.

But unfortunately the lateral movement is *not* uniform. Helmholtz's dispersion images of a point in and outside the focus show that the distribution of light in the dispersion image is considerably altered. The texture of the bundle of rays between the lens of the eye and the retina is by no means regular, or, to word it more accurately, the deviations from the fundamental cone are so irregular, that the rays group themselves in a steadily changing manner into a number of partial bundles. In consequence, in one cross-section of the bundle—corresponding to *one* distance of the object—one partial image prevails, in others—corresponding to another distance—another will prevail; and these partial images, which, as said above, are perceived, as *the* images, are perceptibly deviated from each other in direction as well as elevation. The amount of the error in direction of vision certainly depends on the shape of the sights. With massive objects the one-sidedness in general will appear less distinctly than in the alleged tests with mere points and lines. Strictly speaking, for every separate shape of the sights an integration of all the points of the image ought to be made to get at the whole. But in practice the conditions of illumination will have very great influence. In an open notch-sight the horizontal upper edge and one of the oblique edges of the notch will be brightest and therefore of more influence on the total appearance. The reflection of the sky from the fore sight will make one side of it appear brighter. (The fact that this uneven illumination of parts of the aiming apparatus is an additional source of error will not be further discussed here; it has often been justly pointed out by others.) With a cross-wire sight, even under diffused light, the individual lateral error of the eye will also influence the result.

Vision under conditions such as in aiming with rear and fore sights is so to say *against nature*. Our eye is only made, only fit to see objects *clear* and at the same time *in their correct place* at *one* distance; those at perceptibly different distances will be seen either *dimly, inaccurately,* or less dimly *in a wrong place, a wrong direction*. The telescopic sights (and the Grubb sight) avoid this defect in principle by placing the target and the parts of the sighting apparatus (reduced to cross-wires or similar marks) in the *same plane,* the *same distance from the eye*. The natural defects of the eye are thus eliminated, its ability to see and aim are used rationally. Therefore these instruments are preferable to the open sights even if, as in Grubb's instruments, there is no enlargement of the image. For optotechnical reasons essentially an enlargement of more than one has been chosen; it seemed so to say unnatural to make telescopes without enlargement.

As to the advantages of telescopic sights, probably all experts agree that the suspicions which were formerly expressed against too great weight, great length, and particularly too small *field,* are void since prismatic telescopes were introduced.

"It must not be supposed, however," says Alger, "that all these great advantages can be attained at once and without accompanying disadvantages and sometimes mistakes. In the first place it was very difficult to obtain a telescope of large field and yet otherwise satisfactory, and those first issued had a field of only 4°, which is entirely inadequate. With such telescopes, the ordinary rolling and pitching throw the target completely out of the field of view, as does also a small relative lateral motion, and this makes it extremely difficult to get the image of the target at the cross-wires. The telescopes now issued, however, have a field of 17°, which makes pointing easy, since the target remains in the field of view when the rolling is very heavy." Von Kodar, page 718, expresses himself similarly: "The field of a telescope ought to be at least large enough to prevent the gunner from losing the target from his field of view while the ship is rolling, as long as in the mean position of the ship the optical axis meets the target. The limits of rolling within which artillery can be used to advantage are not very wide; 6° to each side may be considered the extreme. An instrument with from 12° to 14° field therefore will be sufficient, although with modern arrangements angles of view up to 20° and more can be obtained." Beside the chief ad-

vantage of a large field, that the target may always be kept in view, there is the further important advantage, that the gunner can observe the hits of projectiles through the telescope, enabling him to judge of the place and effect of the hits, etc., better than with his naked eye." Also, page 724, he says: "The field of view of the ordinary terrestrial telescope is very small, considering its great length and small ocular glass. The latest designs, however, show astonishing improvement in this respect." And pages 733 to 734: "The adoption of telescope sights means an essential progress in ordnance, because by this means only, full use of modern guns regarding precision, efficiency and rapidity of fire can be obtained. Aiming in itself will be facilitated, therefore correct aiming will be easier, and the results of firing increased in consequence."

"It is probable that on the strength of such experience the ranges for firing will grow, yet, with guns provided with telescope sights, a range of say 6000 m. will not mean more than does now a range of from 2000 to 3000 m. A new era confronts us, in which sea fights instead of being decided at close range, will be fought, if not decided, on ranges hitherto not thought of."

Even the perfectly free field, with only its cross-wires, has indisputable advantages over the use of the open sight, where the notch covers half of the field. The easily effected illumination at night (by changing the black cross-lines into white ones appearing on perfectly dark ground) is another advantage. And such is the enlargement in the telescope, although limited (from 2 to 6), by which a more distinct perception of the target is gained, (see the illustrations *d* and *d'* on the plate) and a better observation of the hits and results of hitting.

The intensity of light in a modern sighting telescope with a "pupil of egress" of 5 to 7 millimeters will answer to all requirements.

The opinion is often heard that, beside the ocular, the objective glass also ought to be focused on objects at different ranges. Regarding this *Von Kodar* says in his book, page 717: "With smaller ones" (meaning telescopes) "the focal distance of their objectives being short, such an appliance is unnecesary because the images of objects at different ranges always fall in practically one plane, the focal plane of the objective." Indeed, with an objective of 100 mm. focal distance, a difference of 0.1 mm.

would only result, if the object was as near as 100 meters; with an objective of 150 mm. focal distance, only at 225 m.; with one of 200 mm., only at 400 m. distance. Focal differences of 0.1 mm. cannot be recognized with the usual oculars (one dioptry in field glasses corresponds to 0.4 mm. displacement of the ocular), so with hand telescopes a change of focus is not needed as long as they are not used for considerably shorter distances than given above. Whether with guns the telescopic sights should have a focusing apparatus to help abnormal (nearsighted or farsighted) eyes of the pointers is a mere question of practice, on which opinions of military authorities differ. From the maker's viewpoint it must be said that the less there is *adjusting* movement, the less any *disarrangements* are to be expected.

Von Kodar's saying that the Grubb sight avoids "the influences of parallax which eventually are felt with telescopic sights" is as incorrect as his similar statement regarding "the limitation of the field." The distance between the mirror or objective, which changes the bundles of rays diverging from the cross into parallel rays, to the cross itself, is just as influential for an eventual parallax in Grubb's sight as the distance between the telescope objective and the cross-wires which should be mounted exactly in its focal plane. Also regarding the field, "it is provided that the trees shall not grow into the skies," which is easily shown. Probably a larger field than in the Grubb sight has never been reached, though a number of patents try to furnish means for a large field. It is true that the eye of the observer may freely move within certain limits without causing the slightest inaccuracy in the sighting. But this is equally true for the telescope, for here as well as there, not more nor less, "the eye is bound to one certain point in the optical axis of the instrument." For the mere *perception of the target* with the Grubb sight the eye has, though not complete, yet very ample freedom; but *to see the cross at the same time,* the eye must be reached by the bunch of rays issuing from it, and its opening is equal to that of the lens or mirror projecting the cross into the distance.

Ignoring the great analogy in the composition of Grubb sight and telescope, expectancies as to the merits of the former have evidently gone too far.

Among the several proposed *designs of prisms* the oldest, Porro's crossed prisms (amply described by Von Kodar, page 727

to 9), recommends itself by its simplicity and corresponding cheapness. The use of two separate elementary prisms results in a loss of about 8% of light, which may in most cases be ignored. It might also result in an inconstancy of the adjustment. But it has been shown by careful tests under high strain, for instance by the Swedish artillery, that such is not to be feared.

The so-called "pentaprism" which Von Kodar recommends as the best, does not deserve its praise for reliability and constancy; it is "of one single body" *on paper only*. In practice it can only be made of two pieces; there is perhaps a *small* gain in brightness (avoiding that 8% loss mentioned above) because the two parts touch and can be cemented; but no gain in rigidity. Cementing gives hardly any security for invariability of mutual position, when under such strains as in the present case.

The same is true of the system of prisms used in the telescopic sights of the United States navy.[8]

A distinct progress in this direction was only made when the firm of Carl Zeiss produced those prisms actually consisting of one single piece which are used in the telescopic sights of the Krupp Company.

As a last objection against telescopic sights, it has been said that, although the *perception* of the target is improved, there is not the same *stability of the correct sight line.*

The sight line of open sights is determined as the line between the rear and fore sight; that of a telescope as the line from the center of the cross-wires to the rear focus of the objective lens. (Only this line can be called the "optical axis," or rather takes its place, in all telescopes for aiming or fixing a direction.) In the former case the two points whose connection indicates the direction, are 60 to 100 cm. or even more apart, in the latter case

[8] "Handbook of Telescopic Sights" (page 8 and elsewhere) calls them "the Hastings-Brashear Compound Erecting Prisms." Professor Hastings obtained a U. S. patent for this system in 1897. But it was recommended long before that by E. Abbé, and in 1894, the author showed its application to telescopes made by Carl Zeiss in Jena, and in a meeting of the German Association for Optics and Mechanics in Berlin, on December 4, 1894, showed and thoroughly explained it before a large audience. Also at a meeting of the "Verein zur Befoerderung des Gewerbfleisses in Preussen" in Berlin, on January 5, 1895. He first published it in the papers of that Association (1895, No. 10), and had it protected by the German patent, No. 85971, of March, 1896.

often less than 100 mm. It is argued by some that the security against error in direction is in direct proportion to this distance. From a merely geometrical viewpoint such reasoning is undoubtedly correct. A lateral change of rear or fore sight, say for 1 mm. will alter the direction only about one-tenth as much as the same change in the relative position of cross-wires and objective lens. Yet the *conclusion* from the argument is *erroneous;* for, the *probability* of a lateral change of position of the said parts in a telescope is *less than one-tenth* of that in an open sight. And this is proven, not by argument, but by *experience* and explained by referring to the fact, that a small closed instrument is much better protected than one whose parts have to be fixed separate. Experience of rather long standing has made it evident that the adjustment of telescopic sights, even when fast on the gun itself and remaining in place during the firing, not only has kept as well, but according to the greater strain by enlargement, several times better than that of open sights. This is also indirect proof that the connection of the telescope with the sight and of the sight with the gun will, if properly made, satisfy all requirements.

While the above was written there appeared another article treating of the same subject: *Rostkoten,* first lieutenant in the German 58th regiment of field artillery ("Jahrbücher für die deutsche Armee und Marine," No. 392, pages 571 to 581), speaks in the same sense, saying: "Spirit level and sighting telescope are bound to be the foundation for all future designs of aiming apparatus for field guns."

On page 580 the same author mentions that doubts have been expressed as to the solidity of telescopes, and states, against such objections, that they have been introduced in the German siege and fortress material after the severest tests, and also after exhaustive trials in the artillery of Switzerland, Sweden, Denmark, and Turkey. Roskoten draws from his arguments the following conclusions:

"The aptitude for war use of the telescopic sights now offered by the makers is beyond all doubts.

"In spite of the apparent complication of the apparatus the drill of the pointing gunners is simplified and the quality and uniformity of sighting brought to high perfection."

The results of careful *practical tests* of the comparative accuracy of aiming with and without telescope would be more interesting and convincing than all the more or less theoretical arguments above. The programme for such test offers no difficulty; but the author thinks he himself lacks one condition for making such tests—finding it necessary that the pointers in the test ought to have *full practice* in both kinds of aiming and to be *ignorant* of the *object* of the test. Perhaps these lines will induce an officer in actual service to make the test. It will only be necessary to find the average error, and the probable error, easily computed from a number of single aimings towards the same target by the same pointer, using the one and the other sighting apparatus. Of course, a variety of targets, of illuminations, etc., will be tested and different persons serve as pointers to obtain results free from objection. The enlargement by the sighting telescope ought to be considered separately.

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CLASSES OF OPERATIONS OF THE CONTINENTAL NAVY OF THE AMERICAN REVOLUTION.

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American students are more or less familiar with the principal achievements of the Continental navy of the American Revolution. Numerous writers have popularized the naval successes of that celebrated sea officer, John Paul Jones. Esek Hopkins, the first and only commander-in-chief of the American navy, "Commodore" Samuel Tucker, and Captains John Barry, Joshua Barney, and Silas Talbot have found their biographers, who have done ample justice to their gallant and praiseworthy conduct. In 1813 Thomas Clark wrote the first narrative history of the Continental navy. Clark was not critical of his sources of information, and his statements must be taken with some caution. In 1839 James Fenimore Cooper, the well-known novelist, published a readable and entertaining account of the Revolutionary navy, which, upon the whole, has not been improved upon by other writers. This is not to say, however, that Cooper's history is altogether reliable or judicial in its treatment. It is marked by the bias of the period in which it was written. After the manner of many of our early historians, Cooper wrote with a quill plucked from the wing of the American eagle. To the enthusiastic writers, who breathed the fresh invigorating air of the new Republic, it seemed unpatriotic, almost traitorous, to write down the seamy side of Revolutionary history. Consequently they touch lightly, or even omit entirely, events disparaging to the Americans. Lieutenant

George F. Emmons published in 1853 a list of the vessels and prizes of the Continental navy. This is valuable, although not complete. Later histories of the Continental navy treat the subject popularly. The most recent narratives are those of Spears and Maclay.

These various authors furnish us with considerable detail concerning the movements, engagements, and tactics of the Revolutionary vessels. Additional material of similar character, chiefly in manuscript, is now accessible in our leading libraries. Drawing on these sources of information, let us proceed to classify the different movements and engagements of the vessels of the Continental navy with reference to the objects which the men who controlled the vessels had in mind. Thus, we will obtain a more general view of the operations of the navy of the Revolution than previous writers have taken. Inasmuch as the information so gained bears upon the subject of naval strategy, it may be of some practical value, notwithstanding the great revolution in naval warfare that has occurred in the last fifty years. Captain Mahan has somewhere pointed out, that, while naval tactics vary with the improvements in the motive power and armament of fleets, the basic principles of naval strategy do not. They are as enduring as the order of nature.

The operations of the vessels of the Continental navy will be divided into primary and secondary operations. A primary operation will be defined as one directed against the enemy's naval vessels at sea. Any other operation whatsoever will be called a secondary one. Primary operations will be divided into major and minor. In major primary operations fleets of considerable size and force are matched against each other, as was the case at the battles of Santiago, Trafalgar, and Martinique. Minor primary operations are engagements between some two or three of the smaller vessels of the combatants. A good example of this is the fight between the Bon Homme Richard and the Serapis. Secondary operations are of several forms, chief of which is "commerce-destroying."

It scarcely needs to be said that the Continental Naval Department did not engage its vessels in major primary operations. The Royal navy was vastly superior to the Continental navy in the number and size of vessels, in the number of guns to a ship, and in weight of metal. Indeed, the very existence of the

Continental vessels depended upon their ability to keep outside of the range of the larger guns of the Royal navy. The Continental Naval Department sometimes gave specific orders to its captains to avoid encountering the British "two-deckers," or engaging their ships of war unless one could be found alone.

In the minor primary operations of the Revolution some thirty to thirty-five engagements may be counted. The honors here are upon the whole evenly divided. The Americans captured ten or twelve naval vessels of the enemy. With the exceptions of the frigate Fox, 26, captured by Captain John Manly between New England and Newfoundland; and the sloop Drake, 20, and the ships Serapis, 44, and the Countess of Scarborough, 20, captured by Captain John Paul Jones in European waters, the prizes of the Americans were minor naval craft, averaging ten or twelve 4's and 6's. The British captured or destroyed about the same number of vessels as they lost, but their prizes were, on the average, larger and better armed vessels than those of the Americans. Seven of them were frigates. On the other hand the British had no victory so brilliant as that of Jones off Flamborough Head.

The secondary operations of the navy were more important than its primary. They mainly involved the protection of American commerce, the defense of certain Atlantic ports, the striking of the lines of communication of the British military forces, the attacking of the enemy's commerce at sea, and the threatening and assailing of her unprotected ports and coasts both at home and in her outlying dependencies. Each of these forms of secondary operations will be now briefly considered.

The Continental Naval Department defended American commerce by ordering its vessels to "attack, take, burn, or destroy" the enemy's privateers. One illustration of such orders will suffice. In November, 1778, the Marine Committee of the Continental Congress wrote to the Navy Board at Boston, which had control of naval affairs in New England, that "at present we consider it an object of importance to destroy the infamous Goodrich who has much infested our coast, cruising with a squardron of 4, 5, or 6, armed vessels, from 16 guns downward, from Egg harbour to Cape Fear in North Carolina." The "infamous Goodrich" belonged to a notorious family of Virginia Tories, whose privateers during the Revolution struck terror to the in-

habitants of the Virginia and Carolina coasts. More than once did the Continental Naval Department plan their capture, but without success.

The engagements between Continental vessels and British privateers were often as bloody and as hotly contested as any of the Revolution. An illustration of this is the well-known fight between the American frigate Trumbull and the Liverpool privateer Watt. The Trumbull mounted 28 guns and was commanded by Captain James Nicholson, the ranking officer of the Continental navy, the Watt carried 32 guns and was under the command of Captain Coulthard. The fight took place on June 1, 1780, to the northward of the Bermudas. A notion of its character may be best gained from an extract from a letter of Gilbert Saltonstall, captain of marines on board the Trumbull, written on June 14, 1780. Saltonstall was in the thick of the fight and received eleven wounds.

"On the 1st instant, at 9 o'clock in the morning, Lat. 36° N., Long. 63° W., we saw a sail from mast-head, directly to windward, as soon as she discovered us she bore for us; we got ready for action, at 1 o'clock began to engage and continued without the least intermission for 5 glasses, within pistol shot. It is beyond my power to give an adequate idea of the carnage, slaughter, havoc, and destruction that ensued. Let your imagination do its best, it will fall short. We were literally cut all to pieces, not a shroud, stay, brace, bowling, or any of our other rigging standing, our maintop mast shot away, our fore, main, mizzen, and jigger masts going by the board, some of our quarter deck guns disabled, through ensign 62 shot, our mizzen 157, mainsail 560, foresail 180, and other sails in proportion, not a yard in the ship but received one or more shots; six shots through her quarter above the quarter deck, four in the waist; our quarter, stern, and nettings full of langrage, grape, and musket ball."

The fight was indecisive. Both vessels withdrew seriously disabled—the Trumbull to Boston, and the Watt to New York. A British account of the engagement places the loss of the Watt at eighty-eight, and that of the Trumbull at "considerable more." The Americans gave their loss as thirty-eight, and the British as ninety-two. The Trumbull had two lieutenants killed. Gilbert Saltonstall declared that there had not been a more close, obstinate, and bloody sea fight during the Revolution,

not even excepting that of John Paul Jones off Flamborough Head.

It is significant that the only naval captains who lost their lives in the Continental service were killed in engagements with privateers. Captains Samuel Chew and John Skimmer, both New England men, fell in action while in command of their vessels. Early in 1778 the brigantine Resistance, 10 guns, was fitted out at New London, Connecticut, by Nathaniel Shaw, the Continental agent at this port. Samuel Chew, a native of Virginia, but then a citizen of New London, was given command of her. On March 4, 1778, while cruising in West India seas, the Resistance had a desperate, though indecisive, encounter with a letter of marque of 20 guns. Chew and his lieutenant, George Champlin were killed, and the Resistance was sailed back to Boston under the command of Lieutenant Leeds. Late in the summer of the same year the General Gates, 18, under the command of Captain John Skimmer, captured the brigantine Montague in an engagement in which Captain Skimmer lost his life.

In addition to defending the American commerce by cruising against the privateers and small naval ships of the enemy, the Continental vessels often threw their protecting arm directly around the trade of the states. The Continental Naval Department often detailed its vessels to convoy American merchantmen and packets, bound principally to the West Indies and to France. At times when the trade was bound for France, the Continental ships accompanied it even as far as the Grand Banks of Newfoundland, but as a rule their services did not extend beyond a few leagues from the American coast. Sometimes the naval department ordered its vessels to cruise off the Delaware Bay, or similar channel, to guide and protect incoming shipping.

The Continental Naval Department cooperated with Washington and the Continental army in the defense and the attack of certain ports. In the campaigns around Philadelphia in 1777 and 1778, the Continental vessels were united with the Pennsylvania state vessels, and the combined fleet was placed under the command of Commodore John Hazelwood of the Pennsylvania navy. For a time the American fleet and the two forts below Philadelphia on the Delaware held in check a British fleet which had ascended the river. On the capture of the forts the vessels

could no longer hold their position. Some of the Continental vessels were burned to prevent their capture, while others escaped, passed the city under the cover of night, and took refuge to the northward of Philadelphia. These were later destroyed by the British in a raid which they made on the shipping up the Delaware. The Continental navy lost some ten vessels in these campaigns.

Late in 1779 the Continental Naval Department ordered four of its vessels from Boston to assist in the defense of Charleston, South Carolina, which was then threatened by the enemy. With these vessels together with those of the South Carolina navy a considerable fleet was available for a naval defense of the city. This was intrusted to Captain Abraham Whipple, the senior officer of the four Continental vessels. Whipple advised that a naval defense at the bar on the sea coast, which lay to the eastward of the forts that commanded the entrance to Charleston harbor, should not be undertaken, and later he gave as his opinion that it was impracticable for the armed vessels to cooperate with the forts. Such timid counsels prevailed, and in the end no naval defense of Charleston was undertaken. Three of the four Continental vessels were dismantled, and their guns and crews were removed to reinforce the land batteries and troops in Charleston. On the fall of the city in May, 1780, all four vessels were lost.

In 1779 a Continental ship aided a Spanish fleet in capturing Mobile. As a rule, however, the Continental vessels were too small and weak to command success in the attack and defense of seaports. Several times the Naval Department placed part of its fleet under the control of Washington and the French Admiral, when they were planning an attack upon some port held by the enemy. Several vessels were ordered to cooperate in the joint American and French attack on Newport in 1778. In the fall of 1779 Washington and Count D'Estaing planned to attack Nova Scotia and Newfoundland. The Continental fleet at Boston was to render them what assistance it could. This expedition was abandoned.

The Continental ships struck at the enemy's lines of communication between its army and navy in America, and the British Isles, Canada, the Bermudas, Florida, and the West Indies. After the transfer of the war to the Southern states in 1778 and 1779, transports running between New York and Savannah and Charleston

were vulnerable craft. The first important capture made during the Revolution was that of a transport. On one of the last days of November, 1775, Captain John Manly in the schooner Lee, one of the vessels fitted out by Washington during the siege of Boston, took the brigantine Nancy. Among other stores the Nancy had on board 2000 muskets, 100,000 flints, 30,000 round shot, more than 30 tons of musket shot, 11 mortar beds, and a brass mortar weighing 10,000 pounds. This ordnance was of the greatest value to the Colonists.

The most successful haul of the enemy's transports was made in the spring of 1779. In order to protect the trade of the Southern states, which the British were ravaging, the naval department ordered the Continental vessels at Boston to sweep the coast from Cape May to the bar of South Carolina. On March 13 a fleet consisting of the Warren, 32, Captain J. B. Hopkins, Queen of France, 28, Captain Joseph Olney, and Ranger, 18, Captain Thomas Simpson, sailed from Boston for the coast of the Southern states. Captain Hopkins, a son of Commodore Esek Hopkins, was in command of the fleet. On April 7 he captured the privateer schooner Hibernia. He learned from this vessel of the sailing of a fleet of transports from New York, bound for Brigadier-General Campbell's army in Georgia, and laden with stores and supplies. On the next day, fifteen leagues off Cape Henry, Hopkins fell in with the fleet, and meeting with a trifling resistance, he made prizes of seven of its nine vessels. Hopkins now returned to New England with his eight prizes, and succeeded in bringing them all either into Boston or Portsmouth. The naval department congratulated Hopkins and his fellow captains on the successful outcome of their cruise.

The most important objective of the Naval Department in its operations was the capture of British commerce in transit at sea. It planned to intercept England's sugar ships of the West Indies, her Newfoundland fishing craft, her Hudson bay fleet laden with skins and peltries, her Guineamen with cargoes of ivory, gold dust, and slaves, and her Mississippi trade with its lumber and furs. Plans were made by naval agents and naval officers, to ensnare the enemy's Baltic trade, the Irish linen ships, the Brazil whaling fleet, and homeward bound East Indiamen. The sending of frigates to the Coromandel coast to intercept the enemy's China ships and the trade of India was seriously considered. On one

occasion the Naval Department designed to attack English vessels bound for Canada with cargoes of "Indian goods." But generally it was fleets returning to England at which blows were aimed, for the many vessels which made up these fleets were like honey-laden bees flying homeward to their hives.

The British fishing fleet on the Grand Banks of Newfoundland and the homeward bound West Indiamen were found most vulnerable. It is not practicable for a combatant to prey upon commerce far from his base of operations. The frequent manning of prizes depletes his crews, and compels him to make an early return home. Then too, the chance of prizes being retaken is increased with the distance they must travel to reach safe ports. The operations of Continental ships in European waters was made practicable by their use of French ports as naval stations. In attacking England's commerce, the Naval Department found most promise of substantial reward in directing its vessels to cruise during the summer to the eastward of the Bermudas in the track of homeward bound West Indiamen, laden with rum, sugar, cotton, coffee, and other colonial products. These fleets sometimes consisted of as many as 175 merchantmen under the convoy of a few ships of war. Skillful seamanship found it comparatively easy to cut out a few sail from such large fleets. In three instances Continental ships made captures which netted them more than one million dollars, each.

Two of these fortunate ventures were made in 1779 and the other in 1782. Early in 1779 the ship General Gates and the sloop Providence sent prizes into Boston which sold for £240,000. In August of that year a fleet of four vessels under the command of Captain Abraham Whipple fell in with the Jamaica fleet, bound for London, and convoyed by a 32-gun frigate, and three other armed vessels. Whipple without much difficulty captured ten large merchantment laden with rum and sugar. Seven of these vessels arrived at Boston and one at Cape May, the other two were probably retaken. The prizes with their cargoes sold for more than £250,000. In the fall of 1782 Captain John Barry in the frigate Alliance carried four Jamaicamen richly laden with rum and sugar, into L'Orient, France, which sold for £620,610. This was the largest sum realized on any cruise during the Revolution.

The Committee of Foreign Affairs of the Continental Con-

gress proposed to the American Commissioners at Paris the most extensive naval expedition planned for the Continental fleet. This expedition was to be carried out by two or three of the frigates which the Naval Department were sending to France. These frigates being well manned were early in February, 1778, to sail from France to the French island of Mauritius in the Indian Ocean, where they should refit and replenish their stores. The frigates should next proceed to the Coromandel coast, a twenty days' sail from Mauritius. Here they should intercept the enemy's China ships, and also distress the internal trade of India. The prizes which they would capture could be sold in Mauritius, and the proceeds sent to Paris by bills of exchange. Gorée was recommended as a better port of call than the Cape of Good Hope, where danger was to be apprehended from British vessels. In the same letter the Committee of Foreign Affairs proposed an expedition against the British vessels on the coast of Africa. Neither the strength of the Continental fleet nor the resources of the struggling Colonists permitted them to undertake so extensive an expedition as that to the East India seas.

The Continental Naval Department threatened and attacked the enemy's coasts and towns in the British Isles, Canada, and the West Indies. The movements of Captain Wickes, Conyngham, and Jones in attacking and alarming the British Isles are familiar to all. In November, 1775, two Continental captains captured Prince Edward Island. An attack on the shipping of the Bermudas was ordered to be made, if it was found practicable. Nassau, New Providence, was twice captured by Continental vessels, and once by a Spanish fleet and American privateers under the command of Commodore Gillon in the South Carolina of the South Carolina navy. Two Continental vessels visited the mouth of the Senegal river on the west coast of Africa. Robert Morris when vice-president of the Marine Committee of the Continental Congress planned to send a fleet of five ships against the British possessions in the West Indies and the Floridas.

These expeditions against British coasts, towns, and dependencies, had several objects in view. One of course was the capture of booty. To the extent that the expeditions were against the shipping and commerce of the attacked ports, their object was similar to that of fleets which cruised against shipping and commerce at sea. Another object was to force the enemy to

withdraw part of his fleet from the coasts of the United States in order to defend his attacked possessions. To the extent that he did so the United States would be relieved. The cruises made in the waters around the British Isles had in view the lessening of the prestige of Great Britain, the shaking of her credit, the alarming of her inhabitants, and the raising of her marine insurance; and also the impressing of Europe with the power and courage of the new American nation, and perchance, creating a diversion in its favor. Both a psychological and a political element entered into the purpose of the cruises in British waters. These cruises brought home to both Britain and the Continent a knowledge of the existence of a new flag and a new state in the family of nations.

The naval plan devised by Robert Morris, the vice-president of the Marine Committee deserves additional notice. It was to be put into operation by John Paul Jones and a fleet of five vessels. Jones was first to proceed to St. Christopher in the West Indies, which was almost defenceless, capture the cannon, stores and merchandise there deposited, and then sail for Pensacola, Florida. Morris thought Jones might find it best to pass along the south side of Hispaniola, and alarm Jamaica by putting in to some of its ports. Arriving at Pensacola, he would find the town defended by two or three sloops of war, which could be easily silenced, when Pensacola would fall into his hands with its munitions of war, including one hundred pieces of artillery. Having reduced Pensacola, Jones should send a brigantine and a sloop to cruise at the mouth of the Mississippi, in order to waylay the British merchantmen leaving there in March and April of each year with cargoes of indigo, rice, tobacco, skins, and furs to the value of £100,000 sterling. Returning from the Gulf, Jones might alarm St. Augustine, and finally, he might refit in Georgia, South, or North Carolina. He was directed to carry as many marines as possible for his operations on shore.

Morris's object in this expedition involved a fine bit of naval policy. He proposed not so much the taking of booty, as the alarming of the whole British nation, and forcing the enemy to withdraw some of her naval forces from the coast of the United States. "It has long been clear to me," he said, "that our infant fleet cannot protect our coasts, and the only effectual relief it can afford us, is to attack the enemy's defenceless places, and

thereby oblige them to station more of their own ships in their own countries, or to keep them employed in following ours, and either way we are relieved so far as they do it." Morris proposed his plan as a substitute for one of Jones', which contemplated a descent on the west coast of Africa, and to the carrying out of which the Marine Committee had given its consent. Morris thought that the same results, as Jones sought, could be obtained with less risk by "cruizing windward of Barbadoes as all their Guineamen fall in there."

The Naval Department naturally planned and carried out enterprises which involved two or more forms of secondary operations, or both minor primary and secondary operations. Sometimes it ordered its vessels to take stations at sea such that they would be in position to intercept both the West India trade and the enemy's transports plying between New York and England. Commanders often cruised on the lookout for both the small naval vessels of the enemy and his privateers. Often the Naval Department left the specific object of a cruise to the Navy Board at Boston or the commander of a vessel, and issued merely the general order to proceed to sea and cruise against the enemy.

The reader of this paper has probably drawn parallels, far from fanciful, between the solutions of the naval problems of the Revolution made by the Continental Naval Department, and those of the Spanish-American War made by the Board of Strategy at Washington. The naval problems presented to the two bodies were in certain respects different. Equally striking similarities appear. In both wars the United States was fighting a European power with possessions in the West Indies and the Asiatic Seas. The attacks on Nassau and Morris's proposed expedition against the British West Indies correspond to the movements of the American fleet in the West Indies during the late war. The operations of Wickes, Conyngham, and Jones off the coasts of the British Isles are matched by the proposed descent on the Spanish coast in 1898. The plan made by the Committee of Foreign Affairs in 1777 to send a fleet of frigates to Mauritius and from thence to operate against the Coromandel coast looks singularly like Admiral Dewey's movement from Hong Kong against Manila.

The hope is to be cherished that America will never again cross swords with her kin beyond seas, but if moved by some

untoward fate she should, it is not too much to say that a Naval Board of Strategy at Washington will devise plans of naval attack and defense quite similar to those of the Continental Naval Department of the American Revolution. The weak spots in a nation's armor often prove to be its outlying dependencies, especially when they are situated near the enemy's coast. The principles of naval strategy which led the Continental Naval Department either to attack or to plan to attack Canada, the Newfoundland fisheries, the Bermudas, and the British West Indies are still operative, notwithstanding the vast changes which the past century and a quarter has witnessed in the methods of naval warfare, and in the distribution of the territory of the Western Hemisphere among nations, new as well as old. In a world of change the fundamental principles of naval strategy remain immutable.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A PLEA FOR THE ADOPTION OF THE REVISED INFANTRY DRILL REGULATIONS OF THE ARMY.

By CAPTAIN THEO. H. LOW, U. S. M. C.

Now that the navy has grown until it already trains nearly as many men in infantry as the army, the necessity for its system of training being the best has greatly increased. But this responsibility apparently rests but lightly on its officers, as the subject is usually dismissed with some such remark as: "For God's sake, let us get the best system, whatever that is and stick to it." It would seem that this could be best accomplished by following as closely as possible the army drill in the revision of the navy book now underway.

The regular infantry set the standard: they alone are the specialists to whom company drill is everything, while to others it must always be more or less of a side issue. The navy, busied with the thousand and one aspects of its profession of sailorising, must needs be content on the average with a comparatively limited experience and knowledge of soldiering. Our best tacticians gladly welcome every opportunity to learn from the army, and should as gladly accept their drill.

In joint operations of the army and navy such uniformity of training is most essential. By it alone is that cohesion and solidarity gained which inspires justifiable confidence and unity of action; and which enables each service to render fullest aid and assistance to the other. History shows that to lack of this harmony and cooperation is due the ill success so notoriously attendant on joint operations, whether of the army and navy or

of allied troops. In such cases, war may indeed be said to put a new face on everything. Sources of friction, lying dormant under the smooth routine of peace, under stress of war easily serve to stir up bad blood. Thus until the emergency comes, the weakness, due to these small differences of training or of detail, may remain unsuspected. No effort should be spared therefore to thoroughly harmonize the infantry drills of the services.

It may be said that differences of temperament, characteristics, organization and environment all prevent the navy from adopting the army drill. This apparently means that these necessitate certain differences of training, which is directly contrary to military precepts. These differences are in reality sources of weakness and as such every effort should be made to minimize or neutralize them, which can best be done by uniformity of training. Such differences exist even among the soldiers of the same company, but no company commander would consent to have his system of training affected by them, and the inherent error of allowing these sources of weakness to determine the training remains the same whatever the numbers.

Military training, whether of the sailor or the soldier is peculiarly unsusceptible to change because of extraneous conditions. Thus in the navy, one of the very aims of infantry drill is to counteract any tendency of the environment towards "webfootedness," to make the jacky well set up, smart and soldierly. The essential object is to impress certain lessons on the recruit, to develop in him certain qualities that go to make up the soldier, and enable him to become a handier fighting man. All other considerations are but secondary. But these ends cannot be gained by permitting the recruit to mould the training instead of the training the recruit.

Since there is no royal road to soldiering, there can be no exclusive method for turning sailors into soldiers, and any attempt to saltify the process is almost certain to stultify its effect. There can be but one true type of soldier, and even though the army is able to pursue its infantry training further than the navy, the pattern should be the same for both, the difference in the mold being one of finish merely, and the sailor being prepared to make up for any roughness by his readiness and his navy spirit.

Even if the characteristics and temperaments should be allowed to affect the training, it would have small influence, as the per-

sonnel of the two services no longer differ so greatly. Young Americans, from the interior of the country, now compose the bulk of both services. The old time, "salt" or "dough-boy," whose original characteristics have been obliterated by those years of long service which have fastened on him the peculiar traits of his type, is fast disappearing. However much this passing of the old salt may be regretted, it greatly facilitates the training of the new navy in the company of the army.

Indeed the chief need of this drill in the present navy is for use in landing parties, where conditions of service would be similar to the army. It would seem wise therefore to adopt the tactics best suited for this shore use, and restrict infantry movements aboard ship to such of these as can properly be executed within the narrow limits of a ship's deck. The broadest of these do not make ideal parades, but as well adapt the drill book to the size of each parade ground as revise it to conform to a ship's deck. Indeed, since both organization and deck space vary with each type of ship, each might equally be said to require its own special form of drill. The necessity for such adaptation is also greatly lessened by increased opportunities nowadays for the vastly more beneficial drill of the ship battalion on shore, and on the early introduction of the new Springfield, whose short barrel will greatly decrease the peril to drill of such obstacles as skids and ships' awnings.

Nor can it be said that the revised army drill is not flexible enough for navy needs. Since the exigencies of war can never be foreseen, nowhere will conditions vary more than on the battlefield, and any drill system that is sufficiently strong and flexible to stand the test of war, will surely survive any watch, quarter and station bill ever devised. Any company organized and disciplined to bring order out of the melee of the fight will not be liable to succumb to the ordeal of being broken up in order to be landed in ships boats. Americans are liable to fight in any part of the world, and no drill system can lay any claim to superiority unless it is capable of being used everywhere to the best advantage by all Americans, be they sailors, marines, volunteers, or regulars. Since there is but one such best, the Kentucky colonel's belief with regard to whisky applies equally to this drill,—no one can water it without weakening it to a harmful extent.

Surely it cannot be denied that uniformity has certain advan-

tages, and that reasons exist why infantry training cannot be treated altogether like other drills aboard ship or be governed entirely by considerations of naval life and environment.

It may be urged however that the army drill is not permanent enough, and that it is too elaborate to suit the navy, but neither history nor the most critical examination of the two drill books now in use would seem to bear this out. The new army drill is a revision of that of 1891, which in turn superseded Upton's tactics of 1867. Thus the stability and permanence of the army drill is shown, since, with the exception of tentative changes and those in the manual made necessary by the adoption of the "Krag," the army has had only one new infantry drill within the last generation.[1] Indeed up to very recently the army has rested content with referring to other tactical boards and testing at various posts the changes recommended by the Ruger Board some eight years ago, the very ones which were quickly adopted by the navy and incorporated in the present drill book of 1898.

In such cases, where even the best tacticians can not wholly agree, many minds and boards have been found better than one. Indeed it is only through some such long process of elimination and assimilation of the various theories that the consensus of opinion is determined and the best results gained, as well as any undue preponderance of influence averted. So fruitful to the army have been these years of free discussion and trial that now the navy is forced to again change its drill book. Surely a better and more logical way of doing this can be found than by patching up the old drill and incorporating in it certain essential features of the new army drill, especially as this drill may itself be considered to be such a revision of the navy drill, since both drills sprang from the same source.

But even if in all other respects the conditions were more favorable, the navy is too short of officers and too busy to enable it to make the necessary experiments and tests. Limitations of time render most important that there be no wasted energy, no misguided effort. Hence the additional need of utilizing the army drill and thus benefitting to the utmost by the army's experience and knowledge.

[1] It must be added, however, that these tentative changes, as well as the variations arising from the use of the two rifles, were very plentiful.

For the navy to give up its own drill and adopt the army's might seem to be a step backward, but even so it would only be a step in the same right direction as was the return to the army rifles. In such cases what may well seem at the time wise measures may under altered conditions easily change in character until they become, if continued, veritably harmful.

The fact that the Jacky sees nothing of his rifle outside of drill hours no longer prevents him from using the army rifle. No more should life on shipboard deprive him of the advantages of the army drill. Uniformity in one is no more important than in the other. Both alike are but instruments, means of increasing the ability to inflict injury on an enemy. Analysis of past failures will show inter-change of ammunition to be no more essential to success than cohesion and unity of action.

Previous to fifteen years ago there was no contention that army drill was not suited to navy needs. Indeed for the previous century the navy had been fairly successful in its use of the army infantry drill. Moreover it is significant that though other nations are usually so quick to pick up new advantages none have followed our lead in adopting a special infantry drill for their navy. No other enlightened nation in the world, it is believed, has more than one infantry drill for its entire fighting force.[1] The result of any such attempt on the part of the German navy, for instance, to revise the infantry training regulations of its army may easily be imagined.

The new revised drill book of the army may well be called a pocket edition, cutting in half as it virtually does the old drill regulations and simplifying as well as condensing them.

In it the spectacular is everywhere sacrificed for the sake of utility, and close order loses what extended order gains in importance. The greatest stress is laid on squad formation. Small units are recognized as embryo companies and battalions, and the movements of all are made thoroughly consistent, so that the task of the company commander is greatly assisted by a thorough knowledge on the part of the recruit of his squad drill. The simplicity of the new drill and its avoidance of fine points is seen in the formation for attack, where, in contrast to the old

[1] To be sure this drill may be supplemented, as in the British service, by additional instructions for landing parties, etc.

multiphase formation, each line dissolves into skirmishers on the same ground as the preceding one, that is, on reaching the limit of effective infantry fire. The flexibility of the drill is evident by the provision for the company varying in size from four to twelve squads, and its adaptability, by the ease and rapidity with which any ground can be occupied and fire opened. Indeed the drill may be said to be shorn of all superfluities and stripped down to the fighting trim that carries no dead weight.

It has of late been urged that only the essential part of the drill be changed and that the minor details should be left untouched, owing to the hardship on the officers that any change in them would involve. Though this is apparently a new view, it would be of weight were these details so ingrained in the mind of the average officer or bluejacket.[8] But actual tests show that few besides the younger officers of the service are so familiar with the details as to be inconvenienced by any change in them. Indeed exact knowledge of all these minutiae may hardly be considered to be essential to the average naval officer, since without it these same officers are well qualified to drill their divisions to the point of exactness practically required aboard ship. Much of this detail may be considered by many as so much dead-wood, since its object is to attain a precision and exactness largely theoretical, as far as practical attainment aboard ship is concerned.

Even in the army, exact knowledge of all the details of squad drill is not required of its older officers; and the younger officers of the navy would quickly gain all needful knowledge of any change in details. Indeed, the more trivial and unimportant the change the easier it could be made, because the more gradual could be its introduction.

As, in principle, the new army drill is already similar to the navy and is so simple and flexible as to insure its permanence, it would seem that the navy could as easily adopt it as have the national guard with their monthly drill.

But granting that there are trivialities in the drill who is to divide the non-essential from the essential. Even after deciding on such dead-wood it might easily be found so dove-tailed in with the most important principles of the drill that it could not be

[8] It is the average not the exceptional case that should always be considered.

cleared away without injury to the whole. Again even were it possible to so transplant all the essential parts of the army drill, what is to insure its retaining its old vitality in its new surroundings, and its so harmonizing with them as to weld all parts of the drill book together.

But what makes these details worth considering is that in reality they are not always and under all circumstances as unimportant as they would seem. Even though they have no place on the battle-field, long experience would show their value, if not their necessity, in the proper training of the soldier, especially in recruit training. In the very precision and exactness of the details rest the unsurpassed value of the drill as a means of discipline. By the very difficulty of their execution the soldier is put on his mettle, his best efforts are called for and his interests aroused. Moreover in the smooth perfection and uniformity of their execution pride and esprit are engendered. Small wonder then that these seeming trifles, these unimportant details, are most dear to the heart of all old soldiers; and that the Germans with the almost unlimited time at their disposal for the training of recruits go so far as to still cling to their seemingly useless "goose-step." Surely if it be true that "the fate of a battle may hang on a buckle" then these same details cannot well be neglected.

But, if these details are not made uniform with the army, their value will be largely lost, for nowhere else can they be found in all the perfection of their development. Nowhere outside the army, with its daily company drill, year in and out, can all the rough edges and inconsistencies of drill be worn away, and one be evolved so correct, in every detail, that no flaw can be discovered in it, even under the microscopic scrutiny of habitual daily use. Moreover perfect uniformity is alone possible through the use of the army drill since it alone is provided with sources for the prompt and authoritative decision of all disputed interpretations.

Now that the introduction of military training in schools, and the increased strength of the national guard, have spread the general knowledge of army drill, the navy should be in a position to benefit by utilizing, to the fullest extent, all possible military knowledge of the recruit. Moreover with a uniform drill old soldiers would be encouraged to re-enlist in other branches of the service, a result which would be especially beneficial to the marines.

A separate drill in the navy with differences limited only to non-essentials would surely seem to be magnifying these trivialities by seeking to perpetuate them. If the drills are to be so similar, there must needs be small choice between them, and it would at least seem feasible to provide for the survival of the fittest by allowing the marines to use the army drill.

Surely the navy can well afford to wait such a time as would insure that any change, when adopted, would have more permanence than would be likely to follow any unsatisfactory compromise or hasty revision of its infantry drill.

But whatever the decision, it would seem that, in arriving at it, the advantages of uniformity might well be weighed against any disadvantage of the use of the army drill on board ship; and the fact that the army has the best drill for use ashore should be considered along with the small practical use nowadays for infantry movements aboard ship. Surely under some such examination the necessity for many changes, in order to adapt the army drill for navy use, would vanish, and the better the army drill became known the closer it would be followed, if for no other reason than because of its simplicity, adaptability, and utility.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FOUNDER OF THE NEW NAVY.

By Pay Inspector Livingston Hunt, U. S. Navy.

It may seem superfluous to anyone familiar with the history of the United States navy that an article should be written whose sole reason for being written is to establish once and forever the right to the title of founder of the new navy, or of the steel navy as it might more appropriately be called. That it should be necessary to clear away errors on this point is singular when the facts in regard to it are easily ascertained and are definite; yet when such intelligent newspapers as the New York Sun, the Baltimore Sun, and the Washington Post publish editorials, as they have within the past year, referring to ex-Secretary Wm. E. Chandler or to the late Mr. Whitney as the founder of our modern steel navy, it is time to set them and their readers right, lest the man to whom the credit is really due should not receive the universal recognition to which he is entitled.

Speaking broadly, the modern navy should be said to have begun with the official determination of the government to replace wooden sailing-ships (some of which had auxiliary steam power, others of which had not) with ships whose hulls should be made wholly of metal and whose motive power should be of steam with or without the help of sails. In other words, the wood and the sails were both to be replaced by steel and steam in the active fleet which takes the seas. The "floating batteries" or monitors which were for the defense of ports, were already of iron, and the navy had possessed a few of these since the Civil War, but it had no iron or steel vessels which were intended to cruise or to seek out and fight an enemy on the high seas in any quarter of the

globe. In the summer of 1881, or just before the first definite movement towards the building of a new navy was begun, there were 31 cruising ships in the navy which were classed as serviceable, and while this does not look like an insignificant fleet, a glance at the list will show that the whole fleet consisted of wooden or composite vessels, with auxiliary engines and full sail power. They were stately ships to look upon, when a ten-knot breeze blew on the quarter, but for war purposes they were pictures merely.

In his annual report of November, 1880, the Hon. R. W. Thompson, Secretary of the Navy, had made a general remonstrance against the inadequacy of the navy in respect to the character and the number of its vessels. But this remonstrance reads to the student of history somewhat as if written prô formâ, as if done as a matter of routine duty rather than with the great interest the subject possessed. It is true that he said it was impossible to furnish protection to our mercantile marine "unless a sufficient number of the right kind of vessels are constructed," but he made no specific recommendations to remedy the defect. He was merely following the custom of every head of a department in Washington of referring annually in general terms to the wants of the branch of the Government of which he is in charge, and of stating that these wants are chargeable to the indifference or the inaction of Congress. This is the only way to make an impression on Congress—to keep hammering at it; and Mr. Thompson's remonstrance was merely in order. But when we turn to the annual report of the succeeding Secretary of the Navy, we come upon something altogether different and full of individuality and vigor. A new administration had taken hold at Washington; General Garfield at first, and later, Mr. Arthur was President, and the Hon. Wm. H. Hunt was in charge of the Navy Department. The opening phrases of Mr. Hunt's first and only annual report (for he was sent as Minister to Russia in April, 1882), were as follows: "The condition of the navy imperatively demands the prompt and earnest attention of Congress. Unless some action be had in its behalf it must soon dwindle into insignificance." There follows a proud summary of the navy's career, and of its claims to the people's affection, and then a recital of the method which Mr. Hunt had employed in order to bring Congress to a sense of the necessity of restoring to usefulness what he calls "our languishing and neglected navy." Sec-

retary Hunt says: "Warned by history of such attempts (i. e., attempts to make Congress take action) resulting heretofore in failure, it was thought wise * * * * to present to Congress a scheme which would meet with the general approval of the different branches of the officers of the navy. The danger arising from the advocacy of different and conflicting views and theories, it was thought might be defeated by the creation of an advisory board. Such a board was accordingly ordered, and entered upon the discharge of its duties on the 11th day of July last (1881)."

Here we have the inception of the "new navy," in that now celebrated advisory board convened by order of Secretary Hunt. This order is so important in the history of the navy that I shall give it in full, as follows:

"NAVY DEPARTMENT,

WASHINGTON, June 29, 1881.

I. In order to meet the exigencies of the Navy, it is highly important, in the opinion of the Department, to present in the report of the Secretary at the next session of Congress a practical and plain statement of the pressing need of appropriate vessels in the service at the present time.

Such a statement can best be furnished by an Advisory Board, who may consult together and be able to reconcile conflicting opinions and theories with reference to the number and class of such vessels as should be constructed, and to unite in recommending such as Congress would be most likely to approve.

II. Accordingly, the following officers in the service are detailed to constitute such a Board:

Rear-Admiral John Rodgers,	Lieut. Ed. W. Very,
Commodore Wm. G. Temple,	Chief Engineer B. F. Isherwood,
Capt. P. C. Johnson,	Chief Engineer C. A. Loring,
Capt. K. R. Breeze,	Past Assistant C. H. Manning,
Commander H. L. Howison,	Naval Constructor John Lenthall,
Commander R. D. Evans,	Naval Constructor Theo. D. Wilson,
Commander A. S. Crowninshield,	Naval Constructor Philip Hichborn.
Lieut. M. R. S. MacKenzie,	

III. The Board will consider and advice the Department upon the following subjects:

1st. The number of vessels that should now be built.
2d. Their size, class, and displacement.
3d. The material and form of their construction.
4th. The nature and size of the engines and machinery required for each.
5th. The ordnance and armament necessary for each.
6th. The appropriate equipments and rigging of each.
7th. The internal arrangements of each, and upon such other details as

may seem to be necessary and proper, and, lastly, the probable cost of the whole of each vessel when complete and ready for service.

IV. The members of the Board will assemble in Washington City on the 11th day of July next, at 12 meridian, and will report to the Department the result of their labors not later than the 10th day of November next.

WILLIAM H. HUNT, *Secretary of the Navy.*"

It is but the simple truth to state that the hand that wrote, and the energy that promulgated this order are the impetus that started the building of our new navy. It was Mr. Hunt who inculcated the spirit of progress and of innovation in the ship building which has been carried on by the Navy Department ever since his order appeared. The report of the advisory board was exhaustive and, considering the wooden navy that we then possessed, it was revolutionary, for it recommended, among other vessels, that the following be built: twenty-one iron-clads, five rams, five torpedo gun-boats, twenty torpedo-boats. As a consequence of the energy of Secretary Hunt, President Arthur in his message to Congress of December 6, 1881, said: "I can not too strongly urge you my conviction that every consideration of national safety, economy and honor imperatively demands a thorough rehabilitation of our navy." Congress was at last aroused to action, and on August 5, 1882, passed an Act authorizing the making of plans for two new steel cruisers, a very small beginning, but still a beginning. Meanwhile, in April, 1882, Mr. Hunt had been transferred by the new President, Arthur, from the Navy Depart- to the post of Minister to Russia, and Mr. Hunt's successor was the Hon. W. E. Chandler. Mr. Chandler continued the spirit of progress begun by M. Hunt and ordered a second advisory board to convene on November 13, 1882, in order to make recommendations in regard to the proposed two new steel cruisers. As a further and more practical result of the agitation originally begun by Secretary Hunt, Congress, in 1883, authorized the building of four ships. These four ships were built at last, and deserve to be remembered as the first modern men-of-war in the American navy. Their names were the Atlanta, Boston, Chicago and Dolphin. In 1885, Wm. C. Whitney being then Secretary of the Navy, four additional modern ships were authorized by Congress. Mr. Chandler and Mr. Whitney were thus identified with the actual building, and with the launching of the first ships of the new

navy, but it was clearly Secretary Hunt who had planned their existence, and who had started the effort which resulted in their construction. It is a pleasure to observe that this truth has been recognized by Mr. Chandler himself, who, in a speech delivered in the United States Senate on May 13, 1892, said: "I date the genesis of our new navy with the recommendations of President Arthur and Secretary Hunt in 1881, and the views there expressed found concrete form subsequently to that period in what may be termed the Navy-Reform Act of August 5, 1882." In another part of the same speech, Mr. Chandler says: "The construction of a new navy not only originated with President Arthur and Secretary Hunt, but it proceeded in a general way upon lines laid down by an advisory board organized by Secretary Hunt on the 29th day of June, 1881." The same truth is attested by ex-Secretary of the Navy, John D. Long, on pages 15 and 16 of the first volume of his history entitled "The New American Navy." Maclay, Spears, and Morris, all say the same thing. The Hon. George E. Foss, at present the able chairman of the Naval Committee of the House, said in a speech delivered by him in the House on March 25, 1898, "the first definite step toward the building up of the new navy was taken on June 29, 1881, by Wm. H. Hunt, Secretary of the Navy, who at that time appointed a board of naval officers * * * * to report upon the navy and to 'determine the requirements of a new navy.'"

In view of the above testimony, it seems to me that we should not forget to whom to give credit in seeking the true originator of the new steel navy. The man entitled to that honor is the late Wm. H. Hunt of Louisiana, Secretary of the Navy under Presidents Garfield and Arthur, from March 5, 1881, to April 11, 1882.

DISCUSSION.

AMERICAN NAVAL POLICY. Prize Essay.

Comdr. B. A. FISKE, U. S. Navy.—Two incidental advantages of having specially designed flagships would be:

(1) The admiral and his staff would have abundance of room for attending to all the correspondence and other matters relating to the fleet, and plenty of room for abundant clerical force. The admiral could use his flagship exclusively as a flagship, and not be embarrassed by having to take into account the fact that she is a fighting ship of his fleet.

(2) Every fighting ship of the fleet would be free to attend to its specific duties; and we should not see one of the most powerful fighting ships of the fleet embarrassed in its operations by the attempt to be a flagship besides.

Regarding the protection of the directing personnel, an article in *Le Yacht* of the 25th of February, 1905, written by M. Edwin Cerio, ingenieur naval, is most pertinent and suggestive. M. Cerio recognizes the same faults with the existing conning tower as are pointed out in the essay; and attention is requested to his exposition of them, and to the remedy he suggests.

The remedy that has for a long time been in my mind is somewhat different, and consists mainly in securing the conning tower, as a sort of covered barbette, on top of the forward turret, and co-axial with it. My notion is that this conning tower should be just large enough to hold three men comfortably—say sixty inches inside diameter—with walls thick enough to withstand a 12-inch capped projectile at battle ranges. It would not weigh nearly so much as the present conning tower, and would present a much smaller target. The roof of the turret would have to be considerably strengthened, to stand the weight of the conning tower, and to sustain the blow, if the conning tower were struck; but the additional weight added to the turret roof would be less than the weight of the structure now erected to support the conning tower.

In this tower I would put the captain, the quartermaster, and a midshipman, with a stadimeter; but I would have no mechanism whatever, except the steering wheel, and a 4-inch voice pipe, going down the turret tube to the communication room. Through this tube the captain would talk to his aide, stationed in the communication room. The floor of the tower I would mount on rollers, and I would prevent it from turning with the turret and conning tower by securing it to the voice tube, which would be an extra heavy steel tube, rising from the handling room floor. This steel tube would be utilized also for conveying the steering rod, and actuating the turret indicator. I would cut three 2-inch holes in the top of the conning tower. Through one hole, the captain would stick his periscope; through another, the quartermaster, by means of a short-distance telescope, would watch the steering compass, suspended some ten feet dis-

tant; while through the third, the midshipman would stick his periscope, for use in conjunction with a stadimeter.

These ideas occurred to me while I was executive officer of the Massachusetts. I felt very blind in the conning tower at general quarters,—and so I always went out on the top of the forward turret, where I had a splendid view, and gave orders through the peep-hole of the conning tower to a man inside, who manipulated the various instruments there.

I am aware that my idea of a proper conning tower may seem somewhat bizarre to many, but would not such a scheme have the following advantages?

(a) The captain would have an unobstructed view of 270 to 290 degrees. By putting a similar tower on the after turret, with an observer, the captain could be kept informed of everything going on astern.

(b) The captain, the quartermaster, the steering gear, and all the various means of controlling the ship, battery and engines, would be *practically indestructible.* The ship, itself, would probably be disabled before they were. By being above the turret top, no accident in the turret would affect them.

(c) The captain's brain could work freely, because he would be free from the nerve-racking and distracting effects of the multitudinous bells, and telephones, and voice-tubes, and range transmitters, and deflection transmitters, and battle-order transmitters, and range receivers, and deflection receivers, and engine telegraphs, that now—with the steering wheel—make the conning tower of a battleship as complicated as a watch. He would have nothing to do except give his orders in a quiet tone to his aide, who would be in the communication room, and who would have abundant means at hand to transmit them properly. It need hardly be pointed out that the communication room should be more generously provided than at present, and considerably larger. There is little discomfort in standing on a turret top, when the new 12-inch guns are fired, as I know by trying it.

Professor PHILIP R. ALGER, U. S. Navy.—There are four main divisions to Commander Fiske's admirable essay—general principles, the battle-fleet, naval tactics, and naval administration—each of great interest and full of valuable suggestions, but I shall confine my criticisms to the first two subjects:

General Principles.—It is perhaps because the essayist's conclusion that we should have a more powerful navy than Great Britain is so startling, and so much at variance with commonly held opinions, rather than because of any fault in his logic, that I find myself unconvinced on this point. We have been brought up to contemplate war only as a defence against aggression in which we are to be immensely helped by our distance from the home base of any foreign power of great naval strength, and from this point of view we seem to be far from needing so powerful a navy as that upon which Great Britain depends. If, however, the Monroe Doctrine in its extreme form is to be rigidly maintained for all time, regardless of how future conditions may differ from those which existed when the enforcement of that doctrine was properly held to be

necessary to our safety as a nation, then we should prepare to meet any naval enemy upon equal grounds, upon the high seas, as far from our own shores as he is from his, and under such conditions Commander Fiske's opinion appears more justifiable. Yet I cannot but feel that a broader survey, taking account of all conditions, would lead to a less radical view.

The Battle-Fleet.—If anyone doubts that the fewer the units in any given total displacement the greater the total offensive and defensive power, let him read this division of Commander Fiske's essay and be convinced. It is fair to point out, however, that there are arguments against the battleship of maximum displacement which the essayist ignores. For example, is the limited draft with which we have thus far handicapped our battleships (as shown in Naval Constructor Taylor's recent article in the PROCEEDINGS) altogether a mistake, and can we afford to make our future fighting fleet consist of ships which can only enter a small number of our own ports? And, again, is there not a wise limit to the concentration of responsibility which necessarily accompanies concentration of power?

The argument for battleships whose offensive power consists only of the fire of well-protected heavy guns, has long seemed to me to be unanswerable, and I thoroughly agree with the essayist's statement of this argument. His tables set forth most clearly the tremendous advantage of even a slight superiority of offensive or defensive power, and conclusively demonstrate the importance of the rule that the main object of tactical maneuvers should be to bring a large part of one's own force to bear upon a smaller part of the enemy's force.

The argument for small guns to attack the enemy with high-angle fire seems to me a very weak one,—such guns would seldom hit at long range and would be quite ineffective,—no small projectile fired at a high angle of elevation would pierce a turret top. The real use of rapid-fire guns on battleships is for defence against torpedo-boat attack, and they would far better be left unmanned throughout a fleet action.

The torpedo, notwithstanding its rapidly increasing efficiency, is still, and I believe will remain a defensive, not an offensive weapon for battleships. While we should certainly follow Commander Fiske's advice and "push the improvement of the torpedo to its utmost possible limit," it is still more important, in my opinion, *to devise and put into operation an effective defence against the torpedo*, a matter which we have thus far neglected to even consider seriously.

The essayist touches upon the advantages of having smaller crews for our ships and, in a delightful passage (on page 27), sets forth the superiority of machinery to men in certain important particulars; if the whole essay had been devoted to this one subject, its treatment would not have been incommensurate with its importance. One of the great advantages of the "big-gun ship" is that she would need fewer men. Instead of putting all the men we can on a battleship, we should use every effort to dispense with their services and have as small a crew as possible. Forced, as we have been, against the mighty opposition of conservatism, to introduce mechanical device after mechanical device to do what at first was done by

man-power alone, why do we hesitate and hold back instead of advancing as rapidly as possible along the inevitable path of progress? Just as we finally had to introduce mechanical ammunition hoists, so we will finally have to adopt mechanical stokers, and the sooner we recognize the importance of using every practicable labor-saving device on our ships the better for us. The fewer men, the more we can afford to pay for intelligence and aptitude, the more we can teach them, the healthier and happier they will be, and the less likely will be the defeat of a ship through the demoralization produced by the wounding and killing of her personnel.

The remarks relating to scouts and the bearing upon their importance of the development of wireless telegraphy are interesting and suggestive.

Lieut.-Comdr. ALBERT GLEAVES, U. S. Navy.—There are so many important matters covered in Commander Fiske's essay, that, in order to discuss it adequately, one would have to write a book. Therefore I beg simply to refer to one subject, which demands immediate attention from the Navy, Fleet Signals.

For obvious reasons, the signal question is merely alluded to in the prize essay. A few words, therefore, on the subject of Fiske's system of semaphore signals.

Many naval officers think that his system is the best that has yet been tried in the service. There may be others who think otherwise. It is good news to hear that Rear-Admiral Barker has recommended a number of these electrically controlled four-arm signal sets be installed in the ships of the North Atlantic fleet. Wireless telegraph has not lessened in the least the importance of visual signals, and it is commonplace to point out that, other things being equal, the fleet with the best system of signalling has the deciding advantage; and the four-arm semaphore system, visible all around the horizon up to a distance of 4000 yards in fairly clear weather with a good binocular, and with a speed of forty signals per minute, comes pretty close to the real thing. Why then still cling affectionately to bunting, which, when end on or in smoke, cannot be read at 400 yards? It is like leaning on a broken reed.

Another thing. With the best signals we want the best glasses. Some years ago the navigator of a certain ship owned a glass which was part of the outfit of the Bounty, and it was not unlike the glasses he had on charge. It would be invidious to say that it was a better glass; certainly it was as good. Now, as every one knows, the marine long-distance glass has for very many years remained practically unchanged. Sometime ago Commander Fiske invented a naval telescope so powerful that with it signals might be easily read at a distance of six miles, in average weather, and it was so mounted that a child could work it. It was installed on the bridge of the Massachusetts and it received a favorable report from the commanding officer; there was not an ohm or an ampere or a switch or any other thing which could blight it as a patented, electrical, laboratory instrument; yet it received what Macauley calls red-wood justice; that is to say, it was promptly executed without even an accusation.

However, it is pleasant to read in the service papers that this apparatus

has arisen again and, in an improved form, is now on trial in Admiral Barker's fleet.

Lieut.-Comdr. W. IRVING CHAMBERS, U. S. Navy.—I find so much to admire and so little to criticize in this prize essay that I hesitate to allude to the few points that I regard as obscure or doubtful.

We all know that there are many honest differences of opinion among officers who have the best interests of the service at heart and that this variety of views concerns vital points in our naval policy and the design of our ships. The fact that this is so, is to my mind, one of the best arguments for the existence of that co-ordinating body, the "Board of Directors," the "Thinking Committee," or whatever you choose to call it, so aptly described in this essay.

The specific points that I shall allude to are (1) speed, (2) size, (3) torpedoes, (4) scouts, and (5) position of commander-in-chief.

Speed is declared to be the *first* quality demanded in a fleet fight, but as it is not assumed that the improved armored cruiser is the typical battleship, and as the essayist's ideas regarding the battery and the armor accord with my views, I think it is apparent that speed is intended to be subordinated to those primary features, as it should be, in a battleship. I cannot assent to the idea that our fleet must be "faster than the enemy's fleet" to be successful in war. Too great a sacrifice of other essential qualities must be made in the race to gain this desired end. We must be content with a satisfactory speed, such as that named by the essayist, but we should also bear in mind that of two fleets nominally equal in speed, the fleet that is best drilled and most wisely maintained, will be also the faster when the fight is on, provided we are always successful in having the best there is in material and design.

In regard to size, we follow a sound military principle in concentrating as much power as possible in one ship. But there is a limit, governed by the draft permitted, and we are forced to compromise. Slow-rolling, easy gun platforms are desirable, but increasing the beam or making the ship "massive and broad" does not necessarily accomplish it. Increasing the beam to reasonable limits does, however, permit of getting easiness of motion, the low metacentric height, provided heavy weights, such as guns, are carried high up, and of course there are reasonable limits to this. Within the limits, I fancy our ideal battleship should be about 18,000 tons.

I cannot agree with the statement that "the gun has not improved very much in the last ten years in comparison with the way in which the torpedo has improved in the same time." The gun has improved wonderfully in range, accuracy, rapidity of fire, and penetration during the time mentioned. The torpedo has improved very much in range and accuracy, but in respect of penetration or distinctive effect, it has been practically at a standstill throughout that period and there is little hope of improvement in this particular.

I have the highest respect for the torpedo and I am well acquainted with the latest and best. I am also one of those who believe in it for battleships as well as for torpedo-boats, but I think it will always remain

a secondary weapon, a weapon of opportunity, and I do not believe in the armored cruiser torpedo-boat advocated by the essayist.

Torpedoes will doubtless become a serious menace to battleships, both from submarine boats acting in their proper sphere and from battleships in the line of battle; but when that condition occurs, battleships will be provided with efficient protection to the greater part of their sides below water, a scheme which is practicable at a small sacrifice of speed.

The essayists' views concerning the value of large merchant vessels as long-distance scouts are heartily endorsed by all officers with whom I have conversed on the subject. But there is a different class of scout needed that may be referred to as blockade scouts. This class will be the eyes of a fleet blockading or masking an enemy's fleet at an advanced base, which may be distant 100 miles from the enemy. Slow cruisers will not do. A sufficient number of merchant vessels of proper speed would not be available and these scouts must be provided in times of peace to be available in time of war. They will, furthermore, be more efficient in time of war if well tried out in time of peace, and it is apparent that these scouts may be maintained in a greater degree of efficiency by performing the ordinary peace duties referred to in the essay.

The position of the commander-in-chief of a fleet is one of those problems that cannot be disposed of in a few words. The practice of centuries is a strong argument in favor of retaining him in the line, from which position he can best observe the movements of the enemy. It is necessary for the admiral to see, and it occurs to me that, perhaps, if he were off on the flank of his column he would be in a very poor place to observe the enemy, unless he were on the flank interposed between his own fleet and the enemy. There is evidently a limit to the size of a manageable fleet.

I wish to add my tribute of endorsement of the essayist's graceful allusion to the unselfish work of the late Rear-Admiral H. C. Taylor.

Lieut.-Comdr. W. F. FULLAM, U. S. Navy.—I have read with great interest and pleasure Commander Fiske's prize essay on American Naval Policy. It is a splendid review of the navy's needs and weaknesses, and its arguments are dignified and sound.

It is not practicable, in a discussion of this kind, to touch upon all points covered by the essay. But the following subjects which contribute so vitally to the element of "fight" in the navy are peculiarly well handled by the essayist:

1. The value of big ships.
2. The value of big guns.
3. High freeboard for all guns.
4. Consideration of the torpedo.
5. Special design for flagships.
6. The importance of "Admiralship."
7. The need of a general staff.

It is with matters of this sort that line officers have to deal, and it would seem that they would all vote the same way upon each one of these subjects. That there is necessity for united action by naval officers is shown

by the opposition to the general staff. Personal, class, corps, and "Bureau" interests do not always give way to considerations involving the fighting efficiency of the navy. And if there is opposition within the service—if those who wear the uniform of the navy cannot see the necessity for a general staff—we cannot expect the people at large to be unanimous in favor of a new organization.

This question of a general staff is perhaps the most important of all. A distinguished admiral of our navy—whom we all love and honor—recently brought out at the War College the strongest proof yet afforded of the absolute need of a general staff. Speaking of the manner of beginning the Spanish War, the admiral showed that it was the action of a British Governor that moved our Government to issue the order to Admiral Dewey! The governor declared that our fleet must leave Hong Kong—that it must go somewhere or do something! And so the order was given! But the remarkable—or still *more* remarkable—point is that it was practically impossible to fix the responsibility for this order—to find out who wrote it! One distinguished official who might reasonably have been supposed to be responsible for such an order, declared frankly and proudly in a public address after the war that he had had nothing to do with it! No wonder that the admiral, referring to this astonishing fact, remarked, with a twinkle in his eye, "Truly we go to war in a very *casual* way."

It would seem that if such facts as these were known to the people at large—to the taxpayers who support the navy—even they (not to speak of naval officers) would see the need of a general staff. The burden of the navy will indeed be heavy upon the taxpayer if it is not organized and ready for war—if we are to perpetuate the "casual" system. Such a navy has no *raison d'être*.

Commander A. G. BERRY, U. S. Navy.—Commander Fiske has evidently given his paper so much thought, and has expressed his mind so clearly, that it almost seems presumptuous to say more than that the Department should consider his ideas most seriously in all their bearings.

He points out clearly the needs of a navy—something this country does not bother much about—and then the duty of the navy, a hazy subject in all but a few minds. The mass of the people know little and care less; the army thinks it is *it* and there is no need for any other arm, while the navy is content to be in the background. The country, or the Congress, has yet to learn that the navy is primarily intended to meet the navy of any other country. It has yet to learn that a boy can not do a man's work. The navy's true work is upon the high seas—not locked up in a seaport—and it must be at all times able to "get there" in good shape and on time. It must be able to take a hammering as well as to give it, and if it can not hammer better than its enemy, it is licked. This is clearly brought out by Commander Fiske. While he makes so many good points in his essay, there are one or two that would seem to need a bit more emphasis. His placing the flagship outside of the fighting fleet, from which position a clear horizon of the whole action is maintained, is excellent. Each ship

is then under the eye of the guiding intellect upon which all depends. The flagship might be accompanied by fast light vessels to carry messages or assistance when needed.

Scouting should be reduced to a science, and in time of peace a scouting fleet organized, and trained, and maintained.

Useless drills are enough to drive a man to drink and perhaps to desertion. Everything should give way to mobility of action and to "hitting the target." The engine room force in all ships should be trained daily in all its particular duties, as well as the men at the guns. Naval tactics is something that cannot be learned or taught from that dizzy "pivot chair" in the office. It must come from the fleet. The late Admiral Bunce had a training ground from Fire Island light to a point about 25 miles off Cape Charles, clear of the track of vessels, on which he constantly drilled his fleet in all evolutions; after which there was target practice and then rest and liberty. After each day's work, the conversation, fore and aft, was on the day's work, and no one had time to do more than to drink "Sweethearts and Wives" at the Saturday night dinner. Commander Fiske would keep the fleet at home, divide it into squadrons, and make them fight each other. This certainly is a good idea, and no sea-going officer can find fault with it. Give all hands good hard work—and rest—and they will discuss it, think about it, make suggestions. Keep ships apart, lying in a hot, rainy port with nothing to do—some officers get mighty tired, and some men get mighty drunk and desert.

His suggestion to keep the battle fleet nearer home would, if followed, maintain a higher physique in officers and men, and would permit our people to know us better and tend to raise the navy in the public estimation.

Commander Fiske's essay is a model and it is believed will increase many a sea-going man's circulation.

Captain W. H. BEEHLER, U. S. Navy.—The INSTITUTE and the service are to be congratulated that the prize for this year has been awarded for an essay on the American Naval Policy. Recent events have pointed clearly to the fact that the President and the people demand adequate sea power.

The navy is popular with the whole country, but only a few of our statesmen in Congress feel called upon to advocate naval interests. The President has been almost alone in his patriotic effort to carry out the wishes of the people for a powerful navy, and though deficiency in revenue afforded good excuse for small naval appropriations, he threw the weight of his influence in its favor and secured a part of what is needed.

The essayist has pointed out in general terms what is needed, and also why; but, while I heartily endorse all he has written, I am of the opinion that he should have been more explicit and more emphatic. Why do we need a powerful navy, and what should be its organization and its strength, are questions which necessarily arise when considering American naval policy.

We need a powerful navy because we want to maintain peace, and at

the same time uphold the righteous demands of our people that all nations shall observe proper respect for the laws of humanity, international law, and the Monroe Doctrine. We went to war with Spain because of the intolerable inhumanity of the war in Cuba. Our people threatened war with Turkey because of Armenian persecutions, and when England disputed with Venezuela we asserted the Monroe Doctrine and required a peaceful adjustment of that dispute. The Peace Congress at The Hague has accomplished a great deal in providing means for settling disputes that otherwise might give rise to war, but such a Peace Congress can never advise disarmament any more than that the police should be disbanded when law courts are established. The police force is all the more necessary to enforce the decrees of the court. It is folly to expect to prevent robbery and other crimes by simply neglecting to provide locks, safes, police, and other precautions of modern civilization. The property of individuals must be protected, and the same is true of that of nations. If China had been able to resist England, France, Russia, and Germany, the territories seized at Hongkong, Tonkin, Port Arthur, and Kiao Chao would still belong to China. And if the United States were as indifferent to commerce and sea power, as is China, we would share the same fate.

But there is a distinct peril now menacing us. The wonderful success of Japan in the present war with Russia is a revelation, but still, it only confirms Mahan's doctrine of the influence of sea power. Japan's success is due entirely to her having gained command of the sea, and as long as Japan retains that sea power she will continue to win victories over the Russians. The appearance of this formidable naval power in the Far East necessarily disturbs the world's balance of power, and it is no longer possible for the United States to ignore these conditions with the new power, our next-door neighbor in the Pacific.

China is a much greater country than Japan, and the Chinese as a race are fully equal to the Japanese intellectually as well as physically, and should China ever be roused from her lethargy and her people become inspired with any patriotism, such as is now seen to pervade Japan, the world may expect an uprising that will make all nations respect the claims of China.

Labor unions in California are even now demanding the exclusion of the Japanese as well as the Chinese, and Americans insist upon their rights to enter China as missionaries and traders to do as they please.

It will be necessary for us to be fully prepared to maintain our rights in the east, and especially to preserve the integrity of the Philippines, while our only means of doing so is by having a thoroughly efficient and adequate navy.

Our navy should be so strong that no nation will dare to go to war with us. The German Emperor has preserved the peace of Europe for thirty-five years because his armies were so strong that no one dared to go to war with him, and all the world knows that the French desire for revenge after the Franco-Prussian war was only quenched by the fact that the German army was too strong for France to dare to fight it.

As the richest and most advanced nation, we need an adequate navy which should be at least equal to that of any other power. Surely our sea coast and our position as the guardian of the American continent require us to have a navy at least equal to that of any other nation. England now has fifty-eight battleships, while we have but fifteen. In the course of ten years, judging from the past decade, England will have about one hundred battleships, and other nations will largely increase their naval forces. Germany completes her naval program this year, and has thirty-eight battleships built and building, with a proposition to enact a new naval program for thirty-eight more battleships, or seventy-six in all, by 1914. The United States should therefore have one hundred battleships by 1914 to equal the navy of Great Britain, but it hardly seems possible that Congress would authorize ten new battleships to be laid down for the next seven years to give us one hundred battleships by 1914. We have now twenty-five battleships built and building, and it does seem that we ought to be able to get a fleet of fifty battleships by 1914 if we could only lay down about four annually for the next six years.

In considering the organization and strength of the fleet we should base the requirements upon the number of battleships, and that there should be two armored cruisers for every three battleships, one fast scout for every two battleships, and two torpedo destroyers for each battleship. These scouts should be the largest fast trans-oceanic mail steamers, capable of maintaining a sea speed of twenty-four knots. These military scouts should belong to the navy, and in time of peace be simply leased to steamship companies for trans-oceanic mail service.

There is at present not a single merchant steamship under construction in any American shipyard for ocean merchant marine, and American merchant marine is now at its lowest ebb. The building of such scouts will therefore be a means of reviving American commerce on the high seas.

The above four types of vessels are the only ones that should be built for the navy; that is, battleships, cruisers, destroyers, and fast scouts for the merchant marine. No vessel should be built for a peace navy, or to perform the duties mentioned in the essay in connection with a weak navy. Obsolete battleships, our present cruisers and gunboats, and converted merchant vessels will serve to do all that should be required in operation against weak navies.

We need the battleships now in order to learn how to use them most efficiently and then to evolve a proper system of naval tactics. There is only one way to develop the science of naval tactics, that is, by practice. We have made some progress by the war games at the Naval War College, but the results cannot be considered conclusive. One point in particular is, in my opinion, of great importance, namely, how can we provide for the use of a *reserve* in a fleet action, as the reserves are called upon to decide a battle on land. On the high seas there are no mountains or convenient places by which a portion of a fleet can be under shelter and still available to enter the engagement, but our tactics should throw some light on this subject. The essayist has commented upon the opportunities enjoyed by the army to develop tactics, but we are without such experience. The

tactics proposed by Admiral McCalla have something analogous to a reserve, but we must try this system or develop something similar in order to reach perfection.

There are many other features of this essay worthy of the profound study of all naval officers, especially the question as to specially fitted flagships, the position of the commander-in-chief, etc., etc. In the German navy their program calls for thirty-eight battleships to form one fleet of four squadrons, which shall have four flagships and two reserves. These novel points therefore seem to have been considered abroad, and attention is called to them by the prize essayist most opportunely.

Assistant Naval Constructor J. W. POWELL, U. S. Navy.—The prize essay for 1905 furnishes much food for thought, and opens a host of questions for discussion that should lead to a crystallization of the ideas of the service on many points of importance. An attempt to dwell on more than a few of its features, in discussing so broad a paper, is out of the question where a time and space limit are a necessity. Of the many points raised, however, with reference to which a further word is in order, there is one to which I wish to refer, as justly entitled to full consideration in connection with the subject of American Naval Policy.

This is the subject of changes on vessels while building, to which reference is made on page 38. There is no more exasperating and difficult condition confronting the builder of a naval vessel to-day than the continual changes in the requirements for vessels long after their contracts have been let. These range from a different dimension for a bread trough to the installation of submerged torpedo tubes in vessels nearing completion, the former of trivial importance, the latter affecting the structure in a large proportion of its parts.

It is very difficult for those who have not been directly in contact with the work to realize what is being sacrificed by these changes, for a sacrifice is made for every one. It is expensive in time and money, and as the art and science of warship building is changing most rapidly, and as the changes made during the building period only effect, as a rule, a compromise tending toward the idea accepted at the time, the net result is that when finished our vessels will continue to be so delayed as to be already out of date when compared with the vessels completed at the same time by those foreign powers who recognize the advantage of rapid construction. Both Great Britain and Germany can lay down a vessel more than a year after the date of contract for one of similar size to be built in this country, and have her in commission at the same time.

An examination of the effect of these changes on the work is instructive. The contractors are required to make, in building a first-class naval vessel, in the neighborhood of 3000 plans and sketches. These plans are so intimately interconnected that a modification in one will often require resulting changes to be made in twenty-five, or even a greater number, of others. A considerable period is necessary from the date instructions are received before the necessary plans can be made and approved, and the resultant corrections in others completed, and before the work in accord-

ance with the previously approved plans affected by the change can be stopped. If plans have previously been approved, as is more often than not the case, the orders for material have also been placed without loss of time, as a proper service of material is one of the most essential features of rapid and economical construction. After delivery has been secured, when a change is made which requires some change in the material, a period equal to the time required to replace the same is lost, which may represent several months for even a simple article, for it must be remembered that the private shipbuilder has no naval supply fund to draw on, nor can he afford to keep tied up in stock a large sum of idle money for which he is getting no immediate return.

There is a logical sequence in building a naval vessel which must, in general, be followed, and an unimportant item may often prevent the completion of a very large amount of work. It seems a long distance from a slight change in the type of framing of a gun port to the installation of furniture in a stateroom, and yet they are intimately connected: A change in the former may modify an armor plate; the delay in the receipt of this armor plate holds up the work of furnishing the backing, fitting the armor plate, drilling and fitting armor bolt holes, fitting the scuppers in way of the armor, fitting the stateroom bulkheads which abut against the outside of the vessel, fitting the ceiling in way of the armor plate, laying the linoleum in the staterooms and installing the furniture; while, incidentally, ventilation work, lighting, firemain piping, etc., may also be at a standstill. If only a reasonable number of these changes occurred on a vessel, while still of importance, this would not be so serious a matter, but when these run up to two hundred and more on a single ship, as is at present the case, the cumulative effect is enormous. Also, they are extremely expensive, for the reasons above outlined, and the Government must, therefore, pay exorbitant prices for them compared with the cost of similar work, even if carried out at a navy yard at a date after the completion of the vessel.

There is another item of importance: To obtain the best results in rapid shipbuilding, a spirit of rivalry is almost as necessary and desirable as in training gun pointers. I may cite the case of the work on a certain vessel now building which had been proceeding most satisfactorily, where foremen and workmen showed unusual interest in the progress, because they felt they were directly in competition with another yard at which a similar vessel was building. Certain extensive changes were ordered, which held up the work through a large part of the ship, and the loss of interest that resulted in the incident delay to the progress of the vessel was a real and serious loss to the Government.

A navy is an expensive possession, and is only justified as a *necessary* insurance. No vessel can be properly counted in our naval strength until in commission for several months, and wars are not so long in coming, nor of such long duration, that much can be accomplished after the danger signal of impending hostilities is raised. Had the Kearsarge and Kentucky been constructed within three years from the date of their authorization by Congress, they would have been available for the Spanish-American

war and a welcome addition to our strength. If it were known that war would be declared one year from to-day, between this country and any first-class power, it would be possible to have completed at that date seven battleships and five armored cruisers at present building, and if as a navy we are to be ready for war is it not of prime importance to finish our newest ships as promptly as possible? If it is admitted that the period of construction of a vessel is of first importance, it is a corollary that any action which tends to increase that period must be of great importance to be justifiable. It may be interesting to note a few of the principal changes which have been made in the last ten years.

Under-water sheathing has been decided on after extended debate, only to be later omitted; superposed turrets have been adopted, abandoned, re-adopted and re-abandoned, all in an inconsiderable period. Only a year ago submerged tubes originally called for in two classes of vessels, and which were later omitted as out of date, were again required to be fitted; an accepted type of boiler was condemned, and preliminary instructions looking towards their removal given, only to be rescinded, and later vessels will again carry this boiler. Less important changes covering anchor gear, galley outfit, plumbing, and nearly every other detail in the ship might also be cited. If these changes were simply an exasperation they might be condoned, but they are, at the present time, the most serious cause of delay in the prompt completion of the vessels under contract.

In the past it has taken four years or over to construct every first-class ship now in commission in the navy, while in case of some of these vessels this period has exceeded six years. This excessively long period of construction has been due to some or all of the following causes:

1. The contractor's force poorly organized and inefficient, and building yards poorly equipped.
2. Inability to obtain proper deliveries of material.
3. Inability to keep up with the demand for merchant construction, without neglecting Government work.
4. Strikes.
5. Failure on the part of the Government to furnish proper contract plans, specifications and miscellaneous information.
6. Failure on the part of the Government to furnish armor and armament when required to prosecute the work.
7. Changes made throughout the period of construction.

Of the above causes, the first five have been overcome, or a change of conditions has largely remedied them. It is to be hoped that the sixth will soon be eliminated, although vessels now nearing completion are delayed to a greater or less extent for want of armor or armament. The seventh cause, however, appears no nearer solution to-day than when the first armored vessel in the navy was completed ten years and more ago.

A study of the possibilities of rapid building of naval vessels in this country, together with a comparison of results obtained on merchant vessels, leads me to believe that any of the first-class yards on this coast can to-day duplicate a battleship or armored cruiser for which they have all plans, patterns, and information, in two years, provided always that

the armor, armament, and outfit are forthcoming when necessary; while in the case of an entirely new design a period of thirty months should be sufficient for the work, but this cannot be accomplished if changes are to be permitted after the contract is signed. An examination of the Congressional Record giving the discussions of the last Naval Appropriation Bill, when before the Senate, is illuminating in connection with some features of this question. That we can expect more than one first-class ship a year, while a deficit of many millions stares the country in the face, and while various public works of importance are clamoring for recognition, is improbable. In view of this fact, rapidity of construction is additionally important. If we can, beginning with the ships authorized by the last Congress, complete our vessels in two and one-half years, the net result to the navy at the end of six years, allowing six months from the date of authorization to the date of contract, and supposing only one vessel appropriated for at the succeeding sessions of Congress, will be five ships added to the naval list against three if the average time of construction of forty-two months required by the present contractors is attained—and who can say that our next war will be ten, and not five years away. The general opinion of the shipbuilders to-day is that the only way this most desirable result can be accomplished will be to build all vessels in strict accordance with the plans and specifications, profiting by our mistakes and making our improvements in future work, and leaving the changes to be done during the various periods which every vessel must lie at a navy yard. This work can be carried out as cheaply as at the builder's yard, by a force especially organized for it, and without delaying the date when the vessel becomes a real instead of a paper security to the Government, and a cause for *real* instead of fancied security.

Captain Fiske's statement, that we shall probably do well to accept all possible improvements in the details of ordnance, construction, and equipment, so long as we can approach satisfactory homogeneity in the features of quality of turning circles and speed, therefore, touches on a very serious question, one of the most important, in fact, that is to-day before those who have charge of the provision of the material for the navy; and I believe that no more happy step could be taken at the present time than the elimination of that clause of the contract for naval vessels which permits changes to be made in them while under construction.

Naval Constructor WILLIAM J. BAXTER, U. S. Navy.—The keynote of this admirable paper is contained in the sentence: "A definite responsibility rests on every officer, with a weight proportioned to his rank, to think and set about the best policy for our navy, and throw his influence the right way; so that when war comes the sacrifice of brave men may not be made in vain."

It would seem obvious that the design and construction of a fortress, battleship, or other war unit, should be based upon a well thought out and well understood art and science of naval tactics, yet the author states that they are undeveloped. It would seem to follow, therefore, that if our battleships are improperly designed and built, it is because the responsi-

bility for developing naval tactics has not been thoroughly appreciated. Yet the battleships of the Connecticut class have been measured and weighed by many varying military and technical methods which have almost universally placed them at or near the top of all the ships possessed by the world's navies of to-day.

There always have been, and there always will be, many varying opinions as to the innumerable details which enter into combination in forming that marvelous weapon, the battleship of to-day, and our own service in a short time will have a magnificent homogeneous fleet of 16,000-ton battleships, having a speed, total capacity, armor, and armament, which any admiral will be proud to command; and it is sure that the highest proof of his admiralship in times of peace is to so maneuver this fleet in every way, that his matured and well-considered judgment will aid the service in determining the elements of design and type of the next fleet to be built.

The Indiana, New York, and Olympia were thoroughly tested under all service conditions, and, after a lengthy and careful study of their merits and defects, the Connecticut and Tennessee classes were designed. To make extensive changes in the design of these latter ships and design new types before the latter have been tried out, I believe to be unwise military policy; and our knowledge of all of the facts occurring during the Russo-Japanese war is still so meager that radical changes in type should be postponed until more facts concerning naval experience during this war are not only accurately known, but are thoroughly studied from all points of view. Many of us will remember the conclusions which were arrived at after the few engagements of the Chino-Japanese war, based upon meager or unreliable testimony. How many of those conclusions are accepted as correct to-day in regard to the types and principal details of battleships and armored cruisers?

There are few officers who have not thought how the ships with which they are concerned could be improved, but I entirely disagree with the statement quoted on page 62: "One good idea is worth a year of hard work," and I feel sure that the author also disagrees with this statement, although it is at times prevalent in the service. Brilliant ideas are always welcome, and never more so than in times of emergency, but when an idea involves the performance of a great amount of work, costing a large amount of money, it should be well considered and thoroughly discussed before it is adopted, else this time and money will have been wasted and the service will not have been profited. I believe that the greatest handicap the service has had has been the hasty adoption of ideas which have not been thoroughly discussed and considered; too great conservatism is wrong, but the basing of new designs on actual sea experience and not upon crude ideas is good policy.

Our service is peculiar in that the officers who handle the ships, and the officers who design and build them, are all graduates of the Naval Academy, and are imbued with the same high ideas of efficiency, and the same earnest desire to provide the best ships and fight them in the best way, and it is only by a free interchange of ideas that the best ships can be produced and used. The sea-going officer has experience which enables

him to offer most valuable suggestions, and the officer on shore from his experience can provide the most efficient means for carrying them out in a practicable and reliable manner. It is hoped that in time means will be provided for enabling these two branches of the service to be in even closer touch than they are now, for if there is not full information as to the objects aimed for, the experience and knowledge of the two branches cannot be used to the best interests of the service. The misfits in types and in details, however, are only partially due to the service itself as a whole. We all know how fashions come and go, in warships as in all other things, and it is only by thorough discussion that the merits and demerits of a new fashion can be best ascertained; the double-turret fashion, for instance, is a case in point.

There are many causes which lay ships up at navy yards for lengthy periods; so many that it would require a long article to describe and discuss them. One of the most common is, however, that improvements on ships are not usually authorized until some considerable time after the ships arrive at the yards, and the making of new appliances, together with their installation and design, requires much time; it usually occurring that the ship is not detained owing to repair work, but to the delays of providing improvements. If a policy were adopted that whenever a vessel visited a yard its proposed improvements should be discussed and decided upon, and the actual work not performed until the next visit of that ship to the yard, and if every ship returned to the same navy yard each time, an expense would be saved, because all of the preliminary work of the alterations and improvements could be in progress during the ship's absence; it is also unfortunate when a number of ships are sent to a navy yard simultaneously. Work can be done most efficiently and most economically when it is done quickly and under the best supervision, but when a large number of ships is at a yard at the same time, the work cannot be prosecuted on them in this way.

Captain C. H. STOCKTON, U. S. Navy.—I welcome this paper as a stimulant to service discussion upon pregnant matters of naval construction, naval administration, and naval policy. One disadvantage of our continental position in America and our vast geographical area, is the difficulty of assembling officers together for such discussion, and the additional difficulty of a comparison of our ships and navy with the other great navies of the world.

This want of breadth of view is somewhat shown even on the pages of this essay, where a comparison is made as to the proper sizes of the American and British navies. I hope that I yield to none in advocating a strong and efficient navy for the United States, but it should be governed in its size by the work that it is, and will in reasonable probability, be called to do. To look out for the protection of its sea and gulf coasts, to dominate the waters of the Caribbean Sea, and the approaches to the Panama Canal, to guard the Monroe Doctrine as definitely established, and to protect our over-sea territory, necessarily demands a strong and efficient navy. In its great naval units, *i. e.*, battleships, it must be specially strong, as they are

also political units, duly checked off by other naval powers; they are elements in the laboratory of statecraft, and each unit (each battleship) must be the very best of its kind.

But, given all this, we are not placed in the peculiarly dependent state of Great Britain upon sea power; a small group of islands on the western face of Europe, she not only depends greatly upon the sea for the raw materials for manufacture, but the manufactured articles need the same element for distribution. Her proximity to the great military powers of Europe subject her to chances of invasion, which can only be met by a dominant naval force. Her food is drawn from everywhere; her granary, as has been well said, is the world. Fortunate are we in comparison, and fortunate are we in not having a situation compelling such an overpowering necessity for the largest navy in the world. Our colonies and over-sea possessions are insignificant in size and value compared with those of this island power.

I agree thoroughly, however, with the author of the essay as to the great importance of consideration as to the antagonists with whom we may be compelled to fight, both as to their available force and as to the power of the strongest unit of that force. Intelligent diplomacy should be expected to assure for us at least one strong naval friend, or possible ally, in Europe in case of war. This, with the necessity of preparation for defence, would permit the use of only a portion of any European navy being used against us, and for such a possible detachment or detachments we should be prepared. Such preparation should cause a more or less permanent distribution of our fleet, especially our battle fleet, and cause a squadron of battleships to be regularly attached to our Pacific Coast, based on our home territory, and ready for service in any part of the Pacific Ocean.

Our essayist well says that no matter what kind of forts and ships the enemy may have, our warships will be used mainly to fight warships. If mines are abandoned as matters of channel obstruction, to be replaced by submarine boats and destroyers, as now proposed in Great Britain, it must be borne in mind that it comes precious near to the violation of the old established principle that in an unobstructed channel ships can pass forts, but with an obstructed channel ships cannot reduce forts and enter harbors and inland waters. No doubt with submarine and surface torpedo-boats for day and night work, respectively, blockades and coast operations are rendered more and more difficult, but it is not wise to say that they are impossible.

It is refreshing and stimulating to read the advocacy of speed for all of our vessels, especially for battleships, as being of primary value. Too long the voice of the charmer has been heard singing the other song, and I trust that this question will be reopened in time to give the best possible speed for our newest battleships and for the future. I will not repeat the arguments of the writer, but will say that abroad the greatest defect I have heard logically urged against our battleships is the inferiority of designed speed. Let the battleship swallow the armored cruiser and get more speed with more size rather than waste money on armored cruisers, slow protected

cruisers, and obsolete sailing vessels yet building, not to say wanton expenditure on moderately fast, navy yard built, small cargo-carrying colliers.

The days of the melée, of action at short distance, may now be considered over, and the elements of battleships now demanded are batteries of uniformly large guns, high freeboard, steady gun platform, high speed, good protection, and dispersion of the vital fighting positions. Unless the turrets of the newer battleships are better arranged and protected than those of the older types, an adoption of the English barbette casemate is advisable, with its smaller target and internal isolation, closed ports, and separation from the ammunition rooms. The modern British conning tower, with its clear all-around view, gives a favorable position both for admiral and captain, in action and in peace time.

I find the current opinion in the British naval service to be in favor of as large battleships as the docks, and the Suez and Panama canals, will permit. As to draught of vessels, there seems to have been no great increase with the large increase of displacement. This matter of draught, with our shallow harbors and approaches to our navy yards, is a limitation to us only partly overcome by constant dredging.

The recent re-arrangement of duties in the British admiralty virtually makes the first sea lord a chief of the general staff, with advisory and executive functions; advisory to the first lord and to the board as a whole, and then, with their consent, executive as to movements and details. This seems to me to approach the ideal, bearing in mind the sound remarks of Commander Fiske when he says that no authority given to a subordinate can truly be said to lessen the power of his superior.

It may be well to state here the duties of the first sea lord of the admiralty, which are prescribed to be:

1. Preparation for war: All large questions of naval policy and maritime warfare—to advise.

2. The fighting and sea-going efficiency of the fleet—its organization and mobilization: The distribution and movements of all ships in commission or in fleet reserve.

3. The control of the Intelligence, Hydrographical and Naval Ordnance Departments.

DESERTION AND ITS PREVENTION. See No. 112.

Comdr. O. S. COTTMAN, U. S. Navy.—This is a subject much before the public at the present time as evidenced by editorials in several of the New York dailies of this week, February 5 to 11, and which has been giving serious concern to the Bureau of Navigation for the past five years; hence Captain Williams' article is opportune and the service is indebted to him for bringing this subject up for discussion with a view of submitting to the department a feasible plan of action, which has not already been undertaken owing to the mass of routine work performed by every officer under the bureau concerned with the enlisted personnel precluding the giving of sufficient time to any outside work.

I agree generally with Captain Williams' conclusions, but he evidently has not tried to get any of the reputable detective companies to enter into

arrangements for the arrest of deserters. I have tried all of them on the west coast; none of them would touch it.

As Captain Williams states the causes of desertion are as numerous as the cases. No matter the cause; desertion should not be tolerated, nor should it be winked at by those in authority. Necessary preventive measures should be instituted and carried into effect. The offenders must be caught and punished and the department should take the proper measures to do this and to see that all their agents make every endeavor and lend every assistance to this end. Use all the machinery of the Government. The hunt should be continued until every deserter is arrested; none should be left adrift in the country.

Every man absent over leave is, by Article 896, Navy Regulations, declared a deserter. This should constitute legal desertion until the department proved that there was no intent.

Article 894 requires every endeavor to be made by officers to apprehend promptly all persons who desert or are absent without leave. How many officers make every endeavor? I have heard officers say "Any man who does not want to stay in my ship is of no use on board and the ship is better without him; let him go." Those who talk this way don't make every endeavor to apprehend. To some, the trouble of looking after prisoners awaiting department's action, is too much trouble.

Desertion can only be stopped by concerted action afloat and ashore to apprehend and punish severely all who are guilty of desertion—absent over ten days without legitimate excuse. I believe under present regulations it can be reduced to a minimum—two per cent or less—providing all work together zealously to accomplish the arrest and proper punishment of the offenders.

I would suggest that a list of deserters be published in the principal papers of each State on January 1 and July 1, with request that no employment be given these men and that their whereabouts be reported to the department.

I would also suggest that all first enlistments contain a provision for discharge at end of one year's service, to enable those who find the service unsuited to them to get out with honor.

The Department of Justice should co-operate in the apprehension of deserters, and each U. S. Marshal should be responsible that no deserter is in his district.

PROFESSIONAL NOTES.

Prepared by Professor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS, AND PERSONNEL.

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Erherzog Karl.....	10,600	Trieste.	Launched Oct. 4, 1903.
Erherzog Friedrich ...	10,000	"	" April 30, 1904.
C.....	10,600	"	Projected.
Armored Cruiser.			
Saint Georg	7,400	Pola.	Launched Dec. 8, 1903.
River Monitors.			
Save.....	450	Neupesth.	Launched March 25, 1904.
Theiss.....	450	"	" " " "

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
République.....	14,865	Brest.	Launched Sept., 1902.
Démocratie.....	14,865	"	" May 2, 1904.
Patrie.....	14,865	La Seyne.	" Dec. 17, 1903.
Justice.....	14,865	"	" Oct. 27, 1904.
Vérité.....	14,865	Bordeaux.	Building.
Liberté.....	14,865	St. Nazaire.	"
Armored Cruisers.			
Ernest Rénan,.....	13,562	Brest.	Building.
Jules Michelet.....	13,562	Lorient.	"
Jules Ferry.....	12,550	Cherbourg.	Launched Aug. 23, 1903.
Victor Hugo.....	12,550	Lorient	" March 30, 1904.
Léon Gambetta.....	12,550	Brest.	Under trial.
Edgard-Quinet	14,300 (?)	Brest.	Ordered.
C 17.....	14,300 (?)	Lorient.	Authorized.

The French budget for 1905 consists of the following ships: Edgard Quinet, armored cruiser of 14,300 tons, 40,000 horsepower, and 24 knots; C 17, probably a sister; four destroyers—M 40-43—of 431 tons, 6800 horsepower, and 28 knots; 20 torpedo-boats, 180 tons, of the 1900 programme—395-369; eight submarines—Q 53-60.—*Engineer.*

The *Moniteur de la Flotte*, under date of March 4, states that it has been decided to make the Edgard-Quinet (C-16) and C-17 sister ships to the Ernest Rénan, that is, they will be of 157 meters length, 21.4 meters

beam, and 23 knots speed. The intermediate battery of the two new cruisers will consist of 16 164.7 mm. guns instead of the 12 smaller guns carried by the Ernest Rénan, and C-17 will have 194 mm. guns of the latest model, equivalent in power to the 240 mm. guns of the preceding model.

The boilers of the two armored cruisers Jules Ferry and Jules Michelet will be of the Du Temple-Guyot type, with small tubes, but the majority of the other vessels under construction will be fitted with Niclausse or Belleville steam generators with large tubes.

It appears that when the battleship Justice was launched by the Société de la Mediterranée, her hull was considerably strained, and an inquiry is to be held into the manner in which vessels are launched by this company.

The next programme of construction is expected to contain particulars of a new class of protected cruiser, approximating to the scout type of the British navy. They are to be of 3000 tons displacement, with 26 knots speed, and the first batch will probably be laid down in the course of this year.—*Page's Weekly.*

The *Yacht* draws the attention of French officers to the intention of the British Admiralty to do away with those vessels which have no fighting value. The writer thinks the French should follow our example. A great many of the torpedo-boats dating from 1876 to 1890, should disappear. Our contemporary would have even some of the seagoing boats which cannot now steam at more than 18 knots removed from the list. Four despatch vessels of the Condor type, eight of the Bombe type, and the Fleurus, Wattignies, Léger, and Lévrier would also go. As to some of the cruisers, the Sfax should be struck off the list forthwith, and the Tage, Cécille, Isly, and Jean Bart as soon as possible. In short, it is proposed to do away with, as useless, eighteen various cruisers and about sixty torpedo-boats. In relation to this matter we notice that vessels of better classes are now being attached to the mobile defense stations, the old 35-meter boats being displaced.—*Army and Navy Gazette.*

LOSS OF THE SULLY.—Officers of the French navy have the complete sympathy of their British comrades in the disaster which has befallen the new armored cruiser Sully. According to the report of Rear-Admiral Bayle, the rock upon which she struck was not in the chart, which seems most probable, the damage done is most serious, and there is little hope of saving her. The Sully has been unfortunate, and it will be remembered that the naval officers at Toulon said she was not in a fit state to leave, and had a serious difference of opinion with M. Pelletan on that matter. The Sully is a sister of the Gloire, Condé, Marseillaise, and Amiral Aube, and her cost approached one million sterling. Her displacement is 9850 tons, and she has engines of 20,000 horsepower, with Belleville boilers, calculated for a speed of 21 knots. The cruiser carries two 7.6-inch, eight 6.4-inch, six 3.9-inch, sixteen 6-pounders, and six 3-pounders. She belongs to a very powerful class and is well protected. We hope she may be saved, and it is at least gratifying that there has been no loss of life. The Sully was built at La Seyne, and was completed only in 1903.—*Army and Navy Gazette.*

The Toulon correspondent of *Le Yacht* in describing certain exercises of the French Mediterranean Fleets, notes that the two squadrons engaged opened fire at the unusual distance of 7000 meters, upwards of four miles. The writer observes that this extension of the ordinary range may be attributed to the success which has attended the Japanese operations at long range. Not long since Admiral Fournier regarded 4500 meters as a suitable distance at which to commence firing, while the English ships generally opened at 5000 meters.—*United Service Gazette.*

INCREASE IN THE PERSONNEL.—The Officers (Executive) Corps, which in 1899 numbered 811, has now risen to 1250, showing an increase of 439 in the five years. During the same period the number of engineer officers has risen from 128 to 223; of surgeons, from 142 to 197; of paymasters, from 104 to 164. Similarly the number of warrant officers has risen from 1058 to 1587; of petty officers, from 4740 to 7111; and of seamen from 17,597 to 24,820. It is contemplated to raise the number of the officers and men to 60,000 by 1817, when the naval programme of 1900 has been carried out.—*United Service Institution.*

The new first-class battleship Patrie, which is completing at the La Seyne Yard, Toulon, is to receive as part of her armament a new and more powerful type of 17.7-inch torpedo, the pressure in the air chamber being 2133 pounds instead of 1280 pounds to the square inch. The new torpedo will be supplied to all battleships following the Patrie, and also to the Jules Ferry and all later cruisers, as well as to the Carquois and all the later torpedo-boats, the submarine Q47, and the new ones to follow. The new torpedo, however, is so heavy that it will be awkward to handle in the smaller boats.—*United Service Institution.*

NEW TYPE OF CRUISER.—M. Bertin, Director of the Technical Section of Naval Construction, has just submitted for the consideration of the Minister of Marine plans of a new type of scout cruiser of 1600 tons displacement. These new cruisers are of the new English Scout type. They will be 230 feet long, with a 13-feet draft of water. The engines are to develop 3800 I. H. P., which should give a speed of 18 knots, and enable them to run for 7300 miles without having to coal. Their armament will consist of four 5.2-inch quick-fire guns, placed in sponsons, and four on deck. They will also have seven torpedo-tubes, of which two will be submerged.—*United Service Institution.*

FRENCH SUBMARINES.—The new submarine X was launched at Cherbourg on the 15th ult. She is one of a new type, and with two others, Z at Rochefort, and Y at Toulon, is being constructed for experimental purposes. Of the three X is the smallest, her displacement being only 168 tons, as against 202 of Z, and 213 of Y. Her plans are by M. Romazotti, who designed the Morse and Naïade types. Her dimensions are as follows: Length, 122 feet; beam, 10 feet, draft of water 6 feet 6 inches. Her motor is to have a power of 220 horsepower, which should give a speed of 10.5 knots, and she will have accumulators and an explosion motor.

Four new submarines are to be laid down at Rochefort, after designs by M. Petithomme. They will be somewhat smaller than the Castor type, and they will only have a displacement of 44 tons. Six of the same type are to be constructed at Cherbourg, and the whole group will be known as Guêpe No. 1, No. 2, up to 10.

The submarine Otarie, of the Lynx type, recently launched at Rochefort, went successfully through its trials. 80 feet long, 8 feet broad, with a displacement of 68 tons, the Otarie has a speed of only 8 knots. This altogether inferior speed is the greatest defect of submarines of this type.

These submarines are provided with the Panhard-Levassor petrol motor, which enables them to navigate on the surface and to charge their accumulators meanwhile, till ready to be submerged.

The cruiser Foudre, torpedo-ship, has recently transported to Saïgon two submarines of this type.

Trials have been carried out at Cherbourg between the submarine Z and the submersible Aigrette, from Rochefort and Toulon respectively, before a commission presided over by Rear-Admiral Philibert. Submarine Z was built at Rochefort on the designs of M. Mangas, naval engineer. Its length is 142 feet; displacement, 200 tons; I. H. P., 190; speed, 11 knots. It is provided with an explosion motor.

The submersible Aigrette, designed by M. Laubœuf, is 146 feet long, with displacement of 172 tons; I. H. P., 172; speed, 10½ knots; explosion motor.

Called upon by M. Pelletan to confer with him on the important question of increasing the radius of action of submarines, M. Laubœuf, naval engineer-in-chief, to whom we owe the excellent submersibles of the Narval type, which for two years have worked with the Northern Squadron without giving the least trouble, has submitted to the minister a scheme for a new submersible where radius of action will be far greater than former ones, the displacement, however, being equal to those now in use.

Another point is that the time of immersion from the surface to below the surface will be greatly reduced, two minutes at the most, whereas formerly it took seven or eight minutes. It is easy to grasp the importance M. Laubœuf's idea is diminishing the time of diving. A submersible can be seen at least three miles by a destroyer, and, going at full speed, it takes five or six minutes for the destroyer to reach and attack the submersible, which formerly had not the time to plunge and shelter itself behind its liquid armor. Now, therefore, the only defect in the submarine has disappeared. The increase of radius of action will be arrived at owing to new motors and accumulators, which, of equal weight, will possess a capacity double of those now in use.—*United Service Institution.*

THE STATIONS OF THE SUBMARINES.—There will be a considerable increase in the number of these stations in 1905; there are only four of these in existence at present, or five, if Indo-China is included, where, however, nothing is ready for the reception of the boats; during 1905 these stations are to be increased to twelve.

1. *Dunkirk.*—Four submarines, which will be in commission the whole year; two of these, the Français and Algérien, have been on trial for a long time, and have shown their good qualities; the other two, the Gnôme and Lutin, are of a newer type.

2. *Cherbourg.*—Seven submersibles, the Narval, Sirène, Silure, Espadon, Triton, to which will be added two others, the Aigrette and Cigogne, under completion at Toulon, and two submarines proper, the Morse and X of a new type.

3. *Toulon.*—In addition to the Gymnôte and Gustave-Zédé, which were the foundation of our flotilla, there will be in commission next year for the whole twelve months, the small submarines Loutre, Grondin, Anguille, and Y, a large submarine of quite a new type, which is under construction, and one submersible, the Oméga, in commission for seven months.

4. *Ajaccio.*—The two small submarines Alose and Truite.

5. *Bonifacio.*—The small submarines Souffleur and Dorade.

6. *Algiers.*—The two small submarines Perle and Esturgeon; the following vessels of the same type will be stationed at the under-mentioned places on the North African Coast:

7. *La Goulette.*—The submarines Castor and Otarie.

8. *Susa.*—The submarines Bonite and Thon.

9. *Biserta.*—The submarines Farfadet and Korrigan, and one of the smaller type, the Phoque, and one of a new type Z, now completing at Rochefort.

There are three other colonial stations, which will each have a group of the Naïade type of submarine, viz.:

10. *Rach-Dua (Cape St. James) or Saïgon.*—The Protée and Lynx.

11. *Tonkin.*—Oursin, Méduse.

12. *Diégo-Suarez.*—Naïade, Ludion.

Although this long list of forty submarine units seems imposing, they are, however, of various value. To speak the truth, if the five submersibles of the Narval type, the Gymnôte, and Gustave Zédé, the three submarines of the Morse type, and the four of the Gnôme, can be counted on with some degree of certainty, the same cannot be said of the others. The small

automobile submarines of the Naïade type have not been altogether satisfactory, and the question has been asked whether it would not be better to remove their explosion motors, and only keep the electric system; to do this, however, is to reduce their radius of action.

The opinion is also freely expressed that the Ministry of Marine has embarked too lightly on the construction of a large number of submarine units, before proper experiments have been carried out, and that it would have been wiser to have limited the number of experimental types, while continuing to construct vessels of the Sirène and Français class, which, in spite of their imperfections, would prove a real and practical addition to our submarine stations.—*United Service Institution.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.	Est. date of completion.
Battleships.				
Preussen	13,200	Stettin.	Launched Oct. 31, 1903.	June, 1905.
Hessen	13,200	Kiel.	" Sept. 18, 1903.	Aug., 1905.
Lothringen	13,200	Dantzic.	" May 27, 1904.	May, 1906.
Deutschland	13,200	Gaarden.	" Nov. 19, 1904.	Sept. 1906.
O	13,200	Stettin.	Building.	
P	13,200	Dantzic.	"	
		(Schichau Works.)		
Armored Cruisers.				
Roon	9,500	Kiel.	Launched June 27, 1903.	Nov., 1905.
York	9,500	Hamburg.	" May 14, 1904.	Feb., 1906.
C	9,500	Bremen.	" Building.	
Protected Cruisers.				
Munich	8,000	Bremen.	Launched April 30, 1904.	
Lubeck	8,000	Stettin.	" March 30, 1904.	
Ersatz Alexandrine	8,000	....	Building.	
" Meteor	8,000	Kiel.	"	
N	8,000	....	"	

The German naval budget for 1905 proposes an increase of 141 officers and 2652 petty officers and seamen, bringing the total numbers to 2040 officers and 38,632 seamen, etc. It is proposed to lay down two new battleships, one large cruiser, and three smaller ones, besides torpedo craft, and a specially designed vessel for service with submarines. The German Navy League is making great efforts to secure a larger displacement and heavier guns for the battleships. The new large cruiser will be similar to one already in process of construction, and will have a displacement of 12,000 tons, with a speed of not less than 22.5 knots.—*United Service Gazette.*

The German navy estimates for 1905 amount to a total of 232,200,000 marks. Sums are provided for the completion of the battleships Preussen and Hessen, of the armored cruiser York, of the small cruisers München and Lübeck, and of a division of torpedo-boats, as also for the reconstruction of the ships of the Brandenburg class. This reconstruction has proved more costly than was anticipated, and an additional sum is required. The estimates also provide for the laying down of the two last ships of the Deutschland class, Q and R, and of the large cruiser D, the small cruisers O, Ersatz Wacht and Ersatz Blitz, a division of torpedo-boats, a mining vessel, the gunboat C, which has been delayed, a river gunboat, and a surveying ship. There is also a charge of one and a half million marks for the trial or purchase of submarine boats. In regard to the personnel, there will be 100 new officers, including a vice-admiral, two rear-admirals, and four captains.—*Army and Navy Gazette.*

A mishap has befallen the German battleship Elsass, concerning which not much has been disclosed. She was steaming outside Kiel a few weeks ago, when she lost her rudder. The ship has been built at the Danzig yard of Herr Schichau, and *Ueberall* remarks that there must have been something very defective in the construction, if it be true that the accident happened owing to pressure of water when the ship was turning. It is understood that the Elsass will be under repair for a considerable time. The coast-defense ship Aegir, which has been lengthened, has recently attained a speed of 15.27 on trial. The battleship Schwaben has also been under trial, as well as the armored cruiser Friedrich Carl, and the small cruiser Bremen. The Friedrich Carl attained a speed of 18.7 knots with forced draft, and the Bremen of 23.29 knots.—*Army and Navy Gazette.*

Ueberall reports that the German battleship Braunschweig in her trials made an average of 18.43 knots during a five-hours' run. Her contract speed is 18 knots. In an endurance trial of eleven hours her engines developed an average of 11,588 horsepower. The average speed is not given, but with her engines developing 10,270 horsepower her speed was 16.41 knots, and 17.497 knots with 12,730 horsepower. The replacing of the rudder, which the German battleship Elsass lost on her trials, will take some time. The Barbarossa, of the Kaiser class, will be commissioned to take her place while she is in dock. The Barbarossa also lost her rudder in consequence of the breaking of her stern-post, and has been in dock under repair. Both vessels were built by the Schichau firm. At the trials of the German coast-defence ship Aegir after her reconstruction, the highest speed she attained was 15.27 knots. The results of the trials of the battleship Schwaben are still not published, but it is still hoped that she will be able to make 18 knots in deep water. The armored cruiser Friedrich Karl in a twenty-four hours' run averaged about 18.7 knots, her engines developing an average of 17,759 horsepower. The sea ran high and there was a strong wind against her. Later she made 20.5 knots in a six-hours' run, which still leaves something to be desired. The protected cruiser Bremen made 23.288 knots on the measured mile in deep water. In an endurance trial of ninety-three hours her engines averaged 124 revolutions. The speed is not given, but with 120.55 revolutions her speed was 20.327 knots, and with 135.88 revolutions 22.466 knots. In a long run, therefore, she can be depended upon to maintain a speed of from 20.5 to 21 knots; but it is a pity she cannot carry more coal. The sea-going torpedo-boat S 123 made 28.3 knots on her trials. The same rate of speed was reached by S 125, which is the boat fitted with turbines, and built for a 27-knot speed. The armored cruiser Prinz Adalbert, while running under full steam with forced draft, burst the high-pressure cylinder of one of her engines. A new cylinder will have to be put in.—*Engineering.*

THE BATTLESHIP DEUTSCHLAND.—On November 19, at Krupp's Germania Yard, Kiel, the first ship of the new class, known until now as the N class, was launched, and received the name of Deutschland, by the Emperor, who performed the christening ceremony. The evolution of German naval construction which has led to the type of battleship just launched may be said to have started from the ships of the Kaiser class; these were followed by those of the Wittelsbach class, a much improved edition of which is the series of battleships, Braunschweig (1902), Elsass (1903), Lothringen (1904), Preussen, and Hessen. The warships launched in the last financial year are: Battleships, Preussen, Hessen, Elsass; armored cruisers, Roon, York; protected cruisers, Hamburg, Bremen, Berlin.

The Deutschland initiates a new series of improved Braunschweigs, though the improvements may be said to concern more details than the basis on which the German Admiralty has founded the solution of the battleship problem.

One improvement is the increase of the battery armor, which in the

Braunschweig is 6-inch, and in the new ships will be 6¼-inch. In the Braunschweig class the four 17-cm. (6.7-inch) quick-firing guns, above the battery, are mounted in turrets, whilst in the new class this installation has been repudiated, and single casemates have been adopted instead of turrets. This is a remarkable instance of the difference of opinions entertained on the subject of turrets versus single casemates by English and German authorities, and it may be of interest here to examine the *pros* and *cons* of both systems. The reasons which have led the German Admiralty to adopt single casemates for intermediate-caliber guns are enumerated by Nauticus, and may be reduced to the following: Diminution in weight, greater simplicity in the transmission of orders, and economy; the advantage is also emphasized which is obtained by being able to place the 8.8-cm. (3.5-inch) quick-fire on the top of the casemates, so that these guns are well supported and their ammunition hoists protected. As for the drawbacks of single casemates, the principle is the great reduction of the angles of training, if an efficient protection is to be obtained. In regard to the mounting of intermediate-caliber guns, what has taken place in the British navy is just the contrary of the latest German practice. The system of single casemates is the one which has been exclusively adopted in England up to the ships of the King Edward class. This class and the Lord Nelson class mark a decided improvement on the Queen, London, and Formidable classes, especially on account of the installation of the secondary armament. The British navy may be said to have the best experience as far as single casemates are concerned; in fact, up to the two last classes of ships built and building, the proportion of guns of intermediate caliber mounted in single casemates, turrets, and box batteries, expressed in percentage of the total number of such guns, is:

In the British navy.....	92	4	4
In the German navy.....	32	31	37

Now, just when commencing a new series of warships, England is condemning single casemates—in which more than 850 British naval guns are mounted—and adopting turrets, whilst Germany substitutes turrets with single casemates in the new Deutschland class.

The progress in torpedoes and torpedo craft has required an improvement in what the Germans call "Antitorpedobootsartillerie," and this is, no doubt, to account for the increase of 8.8-cm. guns in the Deutschland class. *Apropos* of the armament best fitted to fight destroyers, the late experience seems to prove the inefficiency of 37-mm. machine guns, and points out to naval designers radical modifications in the choice and distribution of small guns in the battleships of the future.

If that expression, which has had such great success among amateurs of naval problems, that "the microbe will kill the giant" has some particle of sense in it, this is only owing to the fact that the progress of anti-torpedo artillery has not kept ahead of the progress of torpedo armament. Those of the new school who have proclaimed the "*banqueroute des grands cuirassés*" as they picturesquely call it, have still to reckon with a current of new ideas which will probably revolutionize the whole system of anti-torpedo-boat guns, their caliber, and their installation. No caliber under 3-inch will prove efficient, and instead of scattering machine guns on military tops, or wherever there is room left for them, where they are sure to be swept off by the first shells exploding on the enormous superstructures of the present battleships, a more rational plan must be studied, by means of which it must be possible to concentrate in a few positions the required number of guns which are to do their work throughout the whole naval action in which the ship will be engaged. These guns must have the command of the sea in all directions, within a range of at least 2000 yards, so that any torpedo craft sighted between 3000 and 2000 yards may be annihilated before it gets within a dangerous distance. An inclination to standardize the calibers of the heavy guns and abolish intermediate calibers may

be noticed in the ideas lately expressed by different naval critics; if this will mark the new direction of progress in naval design, the new types of battleships will be with great probability based on a heavy gun standard caliber and a standard anti-torpedo-boat caliber, presumably 12-inch guns and 8.8-cm. to 10.5-cm. (3.5-inch to 4⅛-inch) guns, respectively.

To return to the Deutschland and point out some of her features, which will confer to the whole class of her name a number of valuable qualities, and make it an *ensemble* of powerful, uniform, and well-protected fighting units. The Deutschland embodies a thoroughly well studied compromise of all the requirements a German battleship must answer to. As it may be instructive to compare the principal data of the Deutschland with those of other types of warships lately built and building, their characteristics have been gathered in the accompanying table. The most remarkable feature of German naval design is the so-called "intermediate displacement," which also in the new class is not surpassed. No doubt there are good reasons to account for conservatism in this practice—reasons of a general kind, applying to the navies of all countries, and others imposed by special conditions which the German navy must satisfy. The advocates of the 13,000-ton displacement say, first of all, that experience shows that it is not prudent to lay too "high a stake on one card"; besides, Germany must reckon with shallow waters, canals, and limited possibilities of docking.

Considering the displacement, the Deutschland is a capital warship, which reflects much credit on German naval constructors, as she is the happy result of an organic and rational conception of what a fighting ship should be. It might be observed that, since battleships are made to fight battleships, their absolute value is of much smaller importance than their relative value as compared to other battleships, and, once the type is established to which a fighting unit must belong, this must stand fair chances of success whenever engaged in a combat with whatever other unit of type chosen. It is not always practically possible to apply this theory, but whenever one of the fighting qualities of a warship is in a condition of inferiority, some other prominent feature should be so developed as to make up for the one defective, just in the same way as nature in some living beings develops the sensibility of some organs when that of some others is missing or imperfect. To come to a concrete case, if a limited displacement is a condition *sine qua non* for a given battleship, her speed must be such that in ordinary circumstances she must be at liberty to accept or refuse a battle, and impose the combat and its conditions upon the adversary. Limited displacements and great speeds are only compatible with the sacrifice of protection, armament, or tactical qualities, but in the whole the sacrifice of one of these may lead to a fighting unit of more military value than that in which offensive and defensive qualities are equally distributed.

For the sake of argument we may consider the instance of a modified Deutschland, say with 20 knots speed; she would always be able to get out of the way of a République, which, owing to her inferiority in speed, would not get a chance to utilize her formidable armament; such a Deutschland could on the other side inflict severe damage on a Triumph with her heavy 28-cm. guns.

A Deutschland, as she actually is, with 18 knots speed, cannot escape a République nor prevent her 9-inch belt armor being pierced by the République's 12-inch guns, and cannot inflict any serious damage upon this hypothetical enemy whose armor makes her the most invulnerable ship afloat; the 18-knot-speed Deutschland would not have a chance to engage in a battle with the Triumph, which, conscious of the Deutschland's superiority, offensive and defensive, would have to rely for her safety completely on the evolutionary superiority her 19 knots speed confers on her.

Examining further the fighting qualities of the Deutschland, it may be said that the choice of the 17-cm. guns, as an intermediate caliber, has more enthusiasts than opponents. The latter affirm that all guns above 6-inch cease to be easily handled, and that the rate of fire is much reduced

Principal Characteristics.	Dreadnaught Class.	Battle Cruiser Class.	Republique.	Emperador	France Class.	Kashima Class.	Mississippi Class.
Nationality	German	British	French	Russian	U. S. of A.	Japanese	Italian
Normal displacement, tons	18,000	16,350	14,880	16,680	About 16,000	16,400	13,650
Length at the water-line, ft.	400	425	440	425	450	455	435
Extreme breadth, ft.	73	78	79½	78	76½	78½	73½
Mean draught, ft.	25½	26½	27½	27	27½	26½	25½
Speed	18	18.5	18	18	18	18.5	22(?)
Indicated horse-power	16,000	18,000 (?)	17,500	18,000	16,500	21,500	21,000
Armor—							
Water-line belt—Amidships, in.	9	9	11	11	9	9	10
" Forward, in.	7 and 4	6 and 3	6	6	4	6½	6 and 4
" Aft, in	7 and 4	2	6	6	4	6½	6 and 4
Citadel side armor, in	5½	8	10	?	7	6	8
Casement side armor, in	6½	7	6	None	7	6	None
Heavy gun barbettes, in	10	13	11	12	10	9	10
Turrets, in	11-in. guns, 11	12-in. guns, 12	12-in. guns, 12	12-in. guns, 12	12-in. guns, 10	12-in. guns, 9	10-in. guns, 10
		9.2-in. guns, 7	6.4-in. guns, 5	8-in guns, 7	8-in. guns, 6	10-in. guns, 5	6-in. guns, 6
Armored deck, in	3	2	2 + 3	4 + 2½	3	3	4
Conning tower—Fore, in	12	13	12	12	9	9	10
" Aft, in	6	3	—	6	5	4	—
Artillery	4 11-in. in two turrets	4 12-in. in two turrets	4 12-in. in two turrets	4 12-in. in two turrets	4 12-in. in two turrets	4 12-in. in two turrets	2 12-in. in two turrets
	14 6.7-in., 10 in casemates, 4 in single casemates	4 9.2-in. in turrets	18 6.4-in. in turrets and casemates	12 8-in. in turrets	8 8-in. in turrets	4 10-in. in four turrets	12 8-in. in six turrets
	22 3.5-in. (24-pdrs.)	10 6-in. in casemates		20 3-in.	12 7-in.	12 6-in. in casemates	12 3-in.
	4 3.7 cm.	14 3-in.	26 3-pdrs.	20 3-pdrs.	20 3-pdrs.	12 12-pdrs.	12 3-pdrs.
	4 8 mm.	14 3-pdrs.	2 1-pdrs.	12 Machine guns	12 Machine guns	6 Pom-poms	4 Maxims
	1 6 cm.	2 Pom-poms					
Torpedo tubes—							
Bow	1 18-in.	—	5	1	4	4	4
Broadside	4 18-in.	4 18-in.		2		1	
Stern	1 18-in.	1 18-in.		1			
Coal, normal, tons	800	950	900	?	2000(?)	1200	1000
" bunker capacity, tons	1800 + 200 oil	2000	1850	?	2200	2000	2800

if they are not loaded automatically, and therefore the doubtful advantage of a better protection and of economy in weight is not enough to justify their mounting in casemates.

Regarded as gun target, it may be said of the Deutschland that in this respect she will mark no improvement on her predecessors. But the proportions superstructures have assumed in modern war vessels is no specialty of German ships alone. The amount of deck-houses, bridges, platforms, guns, and other encumbrances crowded in the neighborhood of the conning tower form a characteristic feature in most other navies' ships, and it is inexplicable how this condemnable practice has so many adherents.—*Engineer.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Lord Nelson	16,500	Glasgow (Beardmore).	Building.
Agamemnon	16,500	Jarrow (Palmer).	"
Africa	16,350	Chatham.	"
Britannia	16,350	Portsmouth.	Launched Dec. 10, 1904.
Hibernia	16,350	Devonport.	Building.
Hindostan	16,350	Clydebank.	Launched Dec. 18, 1903.
New Zealand	16,350	Portsmouth.	" Feb. 4, 1904.
Commonwealth	16,350	Glasgow.	Under trial.
Dominion	16,350	London.	"
Armored Cruisers.			
Minotaur	14,600	Devonport.	Building.
Shannon	14,600	Chatham.	"
Defence	14,600	Pembroke.	"
Orion	14,600	....	....
Duke of Edinburgh	13,500	Pembroke.	Launched June 14, 1904.
Black Prince	13,500	Blackwall.	" Nov. 8, 1904.
Warrior	13,500	Pembroke.	Building.
Cochrane	13,500	Glasgow.	"
Natal	13,500	Barrow.	"
Achilles	13,500	Newcastle.	Building.
Hampshire	10,700	Elswick.	Launched Sept. 24, 1903.
Devonshire	10,700	Chatham.	" April 30, 1904.
Roxburgh	10,700	Glasgow.	" Jan. 19, 1904.
Antrim	10 700	Clydebank.	" Oct. 8, 1903.
Argyll	10,700	Greenock.	Under trial.
Carnarvon	10,700	Glasgow.	Launched Oct. 7, 1903.
Scouts.			
Adventure	2,750	Elswick.	Launched Sept. 9, 1904.
Forward	2,545	Fairfield.	" Aug. 27, 1904.
Pathfinder	2,610	Birkenhead.	" July 16, 1904.
Sentinel	2,900	Vickers.	Under trial.
Skirmisher	2,900	"	Launched Feb. 7, 1905.
Foresight	2,545	Fairfield.	" Oct. 8, 1904.
Attentive	2,750	Elswick.	Building.
Patrol	2,610	Birkenhead.	Launched Oct. 12, 1904.

PLANS AND ESTIMATES.—A memorandum of the navy estimates just issued shows the estimate for 1905-1906 to be $166,945,000, against $184,445,000 for the current year.

The Admiralty proposes to build during the year one battleship, four armored cruisers, five ocean-going torpedo-boat destroyers, one ocean-going torpedo-boat destroyer of an experimental type, twelve coastal torpedo-boat destroyers, and eleven submarine boats.

King Edward has approved naming the new battleship Dreadnaught and one of the armored cruisers Invincible. The number of men asked for is 129,000, a reduction of 2100.

It has been decided to appoint a rear-admiral to take charge of all the torpedo craft in home waters.

The memorandum says that flotillas of submarine boats are in course of organization.

Since the commencement of the year more than 100 vessels have been commissioned in the reserve.

Lord Selborne, the retiring First Lord of the Admiralty, who has been appointed High Commissioner in South Africa, says the fleet was never in a more perfect state of repair than at present. In discussing new construction he says the study of tactical and other questions led the board to the conclusion that two classes of destroyers are required, one for ocean work and the other for narrow seas. They accordingly decided to combine the qualities of speed and sea-keeping power in a special type of ocean-going destroyer, which is expensive, and the numbers of which must necessarily be few, and to design a new type of coastal destroyer which will be cheap.

Between January 1, 1904, and March 31, 1905, the following ships have been or will be completed and available:

Four battleships, one armored cruiser, four third-class cruisers, twelve submarine boats and a new Admiralty yacht.

At the present time the following are under construction:

Eight battleships, fifteen armored cruisers, one second-class cruiser, one third-class cruiser, eight scouts, eighteen destroyers, and eleven submarine boats.

Lord Selborne announces the constitution of the committee on designs to assist the Admiralty Board, with Admiral Sir John A. Fisher as president. He says the work of this committee will enable the board to insure to the navy the immediate benefit of experience derived from Russo-Japanese naval warfare. He asks Parliament for $250,000 for the commencement of a second royal yacht. The total amount for the commencement of new ships is a little more than $6,250,000.

In conclusion Lord Selborne says it is now certain that oil has taken a place as a fuel for the navy.

THE NEW BATTLESHIPS OF THE LORD NELSON CLASS.—The Admiralty has placed the contracts for the two battleships of the Lord Nelson class, one with Beardmore & Co., Clyde, and the other with Palmer & Co., Jarrow. Had the two lowest tenders been accepted, both would have been built on the Clyde. However, the Government wished to distribute the work. The battleships will be the most powerful yet designed, and will be the highest conception of science as applied to destructive power. They will be 410 feet long, by 73 feet 6 inches, and 16,500 tons burden, or 100 tons more than the ships of the King Edward VII class, while the speed will be 18 knots. In respect of gunpower, the new ships will mark a greater advance than is indicated by this figure. The earlier ships were fitted with four 12-inch guns, four 9.2-inch breech-loaders, and ten 6-inch quick-fire, whereas the new ships will have four 12-inch guns and ten 9.2-inch guns, in addition to smaller guns. An increase has also been made in the length of the guns, as the 12-inch weapons in the new ships will be of 45 calibers instead of 40, and the 9.2-inch guns of 50 calibers instead of 45. Thus, separately as well as collectively, they will far excel in power the armament of any preceding ship. In respect of armor, an advance has also been made, for while the maximum thickness of plates on the broadside of the King Edward VII

class is 9 inches, the more vital parts of the Lord Nelson class will have 12-inch armor. The engines of the new ships are to develop 16,450 I. H. P., and their cost will be about a million and a half each. They are to be ready for commission in three years' time.—*United Service Institution.*

MACHINERY OF BRITISH CRUISERS.—The British Admiralty has placed orders for the machinery of three armored cruisers which are to be constructed in the Royal dockyards. One of the ships will be engined by Scott's Shipbuilding & Engineering Co., of Greenock, another by Harland & Wolff, Belfast, and the third by Humphrys, Tennant & Co., London. These cruisers, to be known as the Minotaur class, are of 14,600 tons displacement, and in respect of guns and armor will be the most powerful cruisers in the British navy, having four 9.2-inch guns and ten of 7.5-inch caliber. The speed will be 23 knots, to be attained by machinery of 27,000 I. H. P. There will be four cylinders in each engine, although the triple-compound system will be still adopted. The diameter of the cylinders is 40⅝ inches in the case of the high-pressure cylinder, 65½ inches in the intermediate, and 74⅝ inches for each of the low-pressure cylinders, the stroke in all cases being 48 inches. The power is to be maintained with the engines making 125 revolutions. Babcock & Wilcox and Yarrow water-tube boilers will be adopted.—*Nautical Gazette.*

Considerable alterations and additions are being made to the battleship King Edward VII to fit her for liquid fuel as an alternative to coal. It is anticipated that these alterations, which are being carried out at Devonport, will be completed before the end of February.—*United Service Gazette.*

To-day (December 10) the sixth Britannia takes the water, Lady Londonderry performing the naming ceremony at the launch at Portsmouth. The old Britannia (late Prince of Wales), which has served as training ship at Dartmouth since 1869, will soon cease to be, the naval college on the hill being now nearly complete. Indeed, by the time the new vessel is ready to hoist the pennant the new institution should be in full working order. The first Britannia was laid down in 1682, and entered into service in December, 1690, as the flagship of Russell. She fought at La Hogue, and later was flagship to Rooke, and to Shovell during the war of the Spanish Succession. The second Britannia was built in 1715 from the timbers of the first, but in the course of an existence extending over thirty years she never once took part in an action. The third Britannia, "Old Ironsides" of Trafalgar fame, was launched at Portsmouth in 1762, but was not commissioned for some sixteen years. She flew the flag of Darby at the relief of Gibraltar in 1781, of Barrington in the following year, of Hotham in 1792, when she was in several engagements in the Mediterranean, and of Thompson at the battle off Cape St. Vincent. In 1803 she was again commissioned for active service as the flagship of Lord Northesk, and was at Trafalgar. After this she was again laid up, and eventually her name was changed to the St. George. The fourth Britannia was launched in 1820. Her principal service was performed in the Black Sea, when she flew the flag of the commander-in-chief at the bombardment of Sebastopol. Later on she was fitted out at Portsmouth as a training ship, moving to Dartmouth in 1863. Six years later she went to the shipbreakers, and a new vessel, the Prince of Wales, which had never been to sea, took up her name and duties. Such, in brief, is the record of the five predecessors of the vessel which is to be named to-day, and it is a glorious record for her to live up to.—*Army and Navy Gazette.*

It is said that the handiest ships in the British or any other navy are the biggest and heaviest—namely, the King Edward class. They answer the least touch of the helm, and swing round almost on their bows if the helm is put at all hard over.—*Engineer.*

WEARING OUT OF HEAVY GUNS.—All the Atlantic Fleet battleships have had their barbette guns changed. In the case of the flagship Cæsar, only two guns have been changed, but other ships have had three, and in one case all four guns landed and replaced by others, and considerable pressure has had to be put on the Woolwich authorities to have all the required guns available. Surprise has been expressed that defects should have been simultaneously discovered in so many of the guns, and also at the fact that although the ships have been in port for two months, the work of changing them should have been deferred until the last moment. The defects are all in the inner, or A tube. In some cases it is worn, but in others the evil is much greater, as the tube has developed serious weakness owing to overheating.—*United Service Gazette.*

On Wednesday, January 18, Messrs. John I. Thornycroft & Co., Ltd., of London, and Woolston Works, Southampton, handed over to the Admiralty H. M. S. Kennet, a twin-screw torpedo-boat destroyer of the latest type, generally known as the River class. She is 225 feet in length by 23 feet 10½ inches beam, with extreme draft of 9 feet 6 inches, and a normal displacement of about 580 tons. The contract under which she was built required a speed of 25½ knots on a trial of four hours' duration, with a horsepower of 7500, but the speed actually attained on the four hours' official trial was 25.999 knots, or practically 26 knots, with about 7900 I.H.P. The armament consists of two deck torpedo-tubes, one 12-pounder, and five 6-pounder guns. This is the first vessel to be completed at the Woolston Works since they were acquired by the Thornycroft Company.—*Engineering.*

H.M. BATTLESHIP HINDUSTAN.—The first-class battleship Hindustan, which was launched from the yard of Messrs. John Brown & Co., Clydebank, on December 19, 1903, has just completed her official trials, the results of which are given below. The Hindustan, the third of the modern British battleships built at Clydebank, is of the King Edward VII class, with a total length of 425 feet, and a beam and draft of 78 feet, and 26 feet 9 inches, respectively. Her displacement is 16,350 tons, and her engines, also constructed by the builders of the vessel, are designed to indicate 18,000 horsepower, giving a speed of 18.5 knots. She is fitted with eighteen boilers of the Babcock and Wilcox type, and three of the cylindrical type. Nearly the whole of the broadside is protected by cemented armor, the thickness of which along the water-line is 9 inches, tapering to 4 inches at the bow and stern. The upper strakes are of 8-inch and 7-inch armor. The deck plating varies from 1 inch to 2 inches thick, and the heavy guns are protected by 12-inch armor. The armament of the Hindustan consists of four 12-inch guns, four 9.2-inch guns, ten 6-inch guns, and twenty-four lesser guns. There are also two torpedo-tubes fitted. Her normal bunker capacity is 950 tons of coal, and the entire complement will consist of 800 men and officers.

OFFICIAL STEAM TRIALS OF H. M. S. "HINDUSTAN."

Nature of trial	30 hours at 3600 I. H. P.	30 hours at 12,600 I. H. P.	8 hours at 18,000 I. H. P.
Draught of water	Forward. 26 ft. 3 in. Aft. 27 ft. 2 in.	Forward. 26 ft. 5 in. Aft. 27 ft. 5 in.	Foward. 20 ft. 4½ in. Aft. 27 ft. 2½ in.
Speed of ship	By log, 11.8 knots.	Mean of 6 measured miles. 17.7 knots.	On measured course, 19.01 knots.
Steam pressure in boilers	149 lb. per sq. in.	191 lb. per sq. in.	190 lb. per sq. in.
Air pressure in stokeholds	0.09 in.	0.15 in.	Water-tube boiler rooms, .5 in. Cylindrical " .7 in.
	Starboard. Port.	Starboard. Port.	Starboard. Port.
Vacuum in condensers	25½ in. 25¾ in.	26.7 in. 26.6 in.	27.1 in. 27 in.
Revolutions per minute	71.9 72	108.8 107.5	120.4 120.7
Mean pressure in receivers: High	111 lb. 111 lb.	162 lb. 160 lb.	169.0 lb. 173.1 lb.
Mean pressure in receivers: Intermediate	15 " 15 "	52 " 51 "	61.6 " 61.6 "
Mean pressure in receivers: Low	—10 in. —10 in.	8 " 8 "	17.1 " 17.5 "
Mean pressure in cylinders: High	41.3 lb. 38.5 lb.	74.4 " 68.0 "	86.5 " 86.2 "
Mean pressure in cylinders: Intermediate	13.0 " 13.95 "	30.2 " 29.8 "	33.2 " 34.3 "
Mean pressure in cylinders: Low, forward	3.16 " 3.46 "	11.54 " 11.37 "	17.7 " 17.5 "
Mean pressure in cylinders: Low, aft	3.16 " 3.35 "	11.56 " 11.36 "	17.5 " 17.8 "
Mean indicated horse-power: High	818 762	2228 2008	2867 2863
Mean indicated horse-power: Intermediate	641 690	2253 2195	2740 2779
Mean indicated horse-power: Low, forward	194 213	1074 1047	1825 1813
Mean indicated horse-power: Low, aft	194 206	1077 1045	1809 1825
Total	1847 1871	6631 6395	9241 9280
Grand total	3718	12,926	18,521
Consumption of coal per indicated horse-power per hour	1.94 lb.	1.76 lb.	1.8 lb.
Water consumption per I. H. P. per hour: Main engines	15.1 "	15.2 "	17.2 "
Water consumption per I. H. P. per hour: All purposes	20.18 "	17.61 "	18.3 "

Engineering.

The first of the new scouts to complete her trials is the Sentinel, and as supplying the first available data as to performances of this class of vessels the reports of the test are of great interest. Until we learn what the other ships have done, it will be impossible to arrive at any definite conclusion; but it may be said that the trials of the Sentinel show very satisfactory results. Being of a new type, the Sentinel was subjected to rather more severe trials than are sometimes carried out by vessels of known and approved design, and the builders also submitted the vessels to a number of special tests with a view to gathering information for future guidance in the designing of these ships should it be decided to add to the number already ordered. Coming to the actual figures of the trials, we find that by the conditions the Sentinel was obliged to make six runs over the measured mile within an hour and a half, and for the remaining six and a half hours of the full-power trial the average number of revolutions required to give a speed of 25 knots. The vessel was loaded, according to the terms of the contract, with all her war stores for the full-power trial which resulted in an average speed of 25.24 knots, which is a quarter of a knot in excess of the contract speed. The mean horsepower developed was 17,500, and the coal consumption, figures for which were obtained by a separate trial, is stated to have been moderate, each ton of fuel sufficing to drive the vessel 11 knots. There are five other vessels of this type completing at various private yards, and all of them should be ready to undergo their trials very shortly, while two, the Skirmisher and the Attentive, have yet to be launched.—*Army and Navy Gazette.*

During the past fortnight we have had much evidence of the great changes which are being brought about by the new scheme of distribution. In all 116 vessels have been put into commission in reserve, comprising nine battleships, twenty cruisers, two torpedo gunboats, forty-two destroyers, and forty-three torpedo-boats, and of these six battleships and six cruisers are on the emergency list. The Admiralty return of last March showed that in all there were fifty-seven battleships which counted as effective vessels. Only two of those vessels are included in the ships to be struck off the effective list, and to-day, including all the King Edwards which did not figure in that return, there are only sixty-five. There is a saving, however, in the annual upkeep of thirteen old vessels, quite inefficient and not included in the return, which could only be regarded at best as forlorn hopes. Thirteen armored cruisers, forty protected cruisers, thirty-six gunboats and torpedo gunboats, and twenty-one sloops, hulks, etc., are also transferred to the sale list, and are being removed from the dockyards to the various mooring grounds which have been decided on. Some forty or more are destined for the Motherbank, a large number also will be taken to the Kyles of Bute, and the remainder will be distributed in various locks and creeks around the coast.

Arguments for and against battleships of moderate dimensions continue to be bandied about, but the fact that no fewer than forty vessels of 16,000 tons and over are building for various powers is sufficient proof that the trend of thought in the Admiralty departments of the powers is not towards the small battleship. The fact that Germany does not build such leviathans is easily explained by the necessity for her vessels to be of moderate displacement for use in the comparatively shallow waters of the Baltic and the North Sea. In the meantime we are proceeding with the construction of large vessels, and last week the keel plates of the armored cruisers Minotaur and Shannon were laid down. The battleship Hindustan, of the King Edward class, has completed her trials, and the Hibernia, which is building at Devonport, is ready for launching. She will not, however, be put into the water until July, and she will then be in a very advanced state.—*Page's Weekly.*

With the object of having torpedo-boat destroyers of similar build and speed in the same division, the flotilla forming part of the Mediterranean fleet is to be reorganized this month on the following lines: 1st division, Exe, Erne, Ettrick, Itchen, and Dee, 25½-knot boats of the river class; 2d division, Kangaroo, Myrmidon, Peterel, Fawn, and Bat, 30-knot boats built by the Palmer Shipbuilding Company; 3d division, Albatross, Desperate, Stag, Coquette, and Foam, 30-knot boats of the Thornycroft type; 4th division, Sprightly, Locust, Orwell, Griffon, and Seal, 30-knot boats built at Laird's; 5th division, Mallard, Banshee, Quail, Earnest, and Bruiser, a mixed class of 27 and 30-knot boats, to be stationed at Gibraltar. The headquarters of the first four divisions will be at Malta, and to each division there is allotted a reserve of three vessels, to be known as the Malta and Gibraltar reserves, respectively, and an additional "ten per cent reserve," consisting of one vessel for each division. This rearrangement will have the important advantage of enabling the principle of standardization to be adopted by the spare parts of the machinery and boilers of the respective divisions being interchangeable, thus reducing the number of such parts carried by the "parent" ship.—*United Service Gazette.*

An important naval change is announced. After to-day, February 19, British warships will commission for two years instead of three, and the time officers have to spend abroad will consequently be reduced by one-third. Ships will come home more frequently and be always kept in the pink of fighting condition, no repair work being allowed to accumulate, as it sometimes does at present.—*United Service Gazette.*

The new training squadron will be composed as follows: St. George, Isis, Gibraltar, Hawke, and Highflyer—the latter carrying naval cadets.

It is rumored that the reconstructed Mediterranean fleet will consist of the two Queen class, three Formidables, three Londons, and the Vengeance. All the Duncan class will go to the new Atlantic fleet, according to service gossip, also the Swiftsure and Triumph. Another rumor places these ships all in the Home squadron. Probably the detail is yet unsettled, but it is apparently established that so far as possible all squadrons will be homogeneous and contain all the ships of any particular type. This is as it should be. Duncans mixed with Londons are wasted, and their speed superiority of no avail. They become transformed into weak Londons.

Stern submerged tubes are to be fitted to the King Edward VII and her sisters. As originally designed, she, the Dominion, and the Commonwealth, were without stern tubes.

The old unprotected cruiser Iris has been put out of commission as a training ship, the Gibraltar replacing her.

A great sale of warships takes place next spring at one or other of the dockyards; three battleships and no less than thirty cruisers will be sold off. The armada thus to be disposed of is understood to be composed as follows: Battleships, Dreadnought, Sultan, Monarch—now Simoon; cruisers, Medea, Medusa, Ringarooma, Pallas, Pearl, Psyche, Marathon, Melpomene, Magicienne, Pandora, Iris, Mercury, Archer, Porpoise, Brisk, Calliope, Cleopatra, Northampton, Barracouta, Barrosa, Blanche, Blonde, Philomel, Mildura, Katomba, Tauranga, Wallaroo, Pomone, Pactolus, and Scylla. One modern cruiser could probably "take on" the lot.—*Engineer.*

It is interesting to note that in the 122 warships which have been placed on the non-effective list there are eleven battleships, ten armored cruisers, forty-three cruisers, thirty-six gunboats and torpedo gunboats, and twenty-

two sloops, hulks, etc. The cost of these vessels when constructed, giving estimates for those whose actual cost cannot now be ascertained, was:

Battleships	£4,861,458
Armored cruisers	3,634,098
Cruisers	6,755,397
Gunboats, etc.	1,611,379
Sloops, hulks, etc.	1,288,245
Total	£18,150,577

—*United Service Gazette.*

Additional important changes in the navy, affecting the officers, will, the *Western Morning News* is informed, soon be announced by the Admiralty. It is fully recognized that a naval surgeon, after some years in the service, not only deteriorates professionally speaking, through no fault of his own, but is also unable to keep up with the almost daily advances in medical science. A scheme is, therefore, in process of formation by which civil surgeons will entirely supplant the present branch, without, however, entailing any hardship whatever on those now serving, who will, in some cases, be able to requalify under the new scheme, while others will either serve out the remainder of their time or be offered extra compensation for immediate retirement. The new plan has not yet been fully formulated, but it has been decided that an appointment will be for one commission only, it being compulsory after that to spend a certain period at some hospital, and receive specified recommendations before further employment. The uniform of the engineer branch is to be assimilated to that of the executive officers. The prefix "engineer" before their rank-titles is also to be abolished, and an engineer officer will in future be known as captain or commander, etc. (E). The present paymaster branch will also probably be abolished. Office work is to be simplified and placed in charge of executive officers who will be borne specially for these duties, not, however, to the detriment of their other work. These important changes are still under consideration, as there are details connected with each to be settled. The proposed alteration in the paymaster's branch is meeting with strong opposition, but Sir John Fisher's reasons are obvious, and it is thought that his opinions will eventually be adopted.

The Admiralty has issued a circular dealing with the position of "domestics" in the Royal navy. Commanding officers of ships and naval establishments are asked to express an opinion as to whether it is desirable to abolish "domestics" and to replace them with Royal marines; whether "domestics," if retained, should become continuous-service men; and whether the juniors of the branch should be properly trained either as cooks or servants in a special school. The Admiralty is also inquiring into the rates of private pay given by officers to their servants.—*United Service Gazette.*

The Admiralty have had under consideration the question of how service in a ship commissioned for service in the reserve shall be treated as regards promotion, allowances, etc., and it has been decided that service shall count as service in a ship of war at sea. Flag and navigating allowances, charge pay, and store allowance will be paid at the rates applicable to seagoing ships. Command money will be paid at the rate of 12s. per day to captains commanding battleships and first-class cruisers. This sum will be increased to 18s. per day in the case of ships whose complements are brought up to full strength.—*United Service Gazette.*

BRITISH STEAM TRIALS IN 1904.—

Vessels.	Full speed. Trial I. H. P.	Trial Speed. Knots.	Coal Consumption. lbs.
Battleships.			
King Edward VII	18,138	19.04	2.17
Commonwealth	18,562	19.37	1.83
Dominion	18,438	19.35	1.77
Hindustan	18,521	19.8	1.8
Swiftsure	14,031	19.93	..
Armored Cruiser.			
Cornwall	22,709	23.8	1.94
Protected Cruisers.			
Amethyst	14,200*	23.63	1.72
Topaze	9,860	22.1	2.65
Diamond	10,066	22.17	2.98
Sapphire	10,200	22.45	2.52
Torpedo Vessels.			
Cherwell	7,250	25.603	2.34
Dee	7,306	25.504	2.28
Waveney	7,307	25.626	2.19
Welland	7,777	26.24	1.65
Kennet	7,445	25.665	2.39
Jed	7,990	25.787	2.46
Derwent	7,241	25.68	2.24
Ribble	7,417	25.817	1.57
Eden	....	26.229	..
Torpedo-boat 114	3,034	25.154	2.15
Torpedo-boat 115	3,047	25.187	1.97
Torpedo-boat 116	3,001	25.22	1.95
Torpedo-boat 117	3,016	25.115	2.0

* Estimated horsepower only. The Amethyst is fitted with turbine machinery. —*United Service Institution.*

STEAM TRIALS OF THE CHINA SQUADRON.—The report of the steam trials at sea of the China squadron is just to hand, and on the eight hours' run every ship did well, exceeding the official contract speeds, although most of the vessels have been three or four years in commission. The best cruiser speed was got with the Amphitrite, built by Vickers, which attained a mean on her eight hours' sea trial of 21.39 knots, as compared with the designed speed of 20.75 knots. Next comes the Andromeda, a dockyard-built ship, engined by Hawthorn, Leslie & Co., which steamed 20.1 knots, only 0.15 miles below the contract rate. Of battleships the Vengeance, also a Vickers' ship, takes first place, with a speed on the eight hours' sea trial now of 19.10, against the designed speed of 18.25 knots. The other ships are the Albion, by the Thames Ironworks, which steamed 18.7 knots; the Glory by Laird, which got 18.6 knots; and the Ocean, engined by Hawthorn, Leslie & Co., which got 18.83 knots. The designed speed in these three cases was 18¼ knots. Practically all of these ships have the Belleville boiler.—*United Service Gazette.*

EXPLOSION ON A SUBMARINE.—A serious explosion of gasoline occurred on Thursday morning on board the new submarine A5 at Queenstown, resulting in the deaths of Sub-Lieutenant F. C. Skinner and three others,

and the injuring of a large number of men. The operation of charging the tanks previous to going out for a cruise was taking place when the disaster occurred.—*United Service Gazette.*

THE HEALTH OF THE NAVY.—A blue-book has just been issued containing the statistical report of the health of the navy for the year 1903. It is stated that the returns for the total force serving afloat in that year may be considered very satisfactory. With a personnel increased by 3500 as compared with the previous year, there are decreases in the ratios of cases, invalidings, and deaths. The numbers are, respectively, 85,735, 2478, and 433, in comparison with 85,769, 2985, and 590 in 1902. The aggregate number of cases of disease and injury recorded for the year furnishes a ratio of 831.57 per 1000, which shows a decrease of 29.56 per 1000 as compared with the ratio for 1902, also a decrease of 48.06 when contrasted with the average of the last six years. As mentioned in the reports for the last five years, the ten years' ratio hitherto shown has been discontinued in consequence of changes in classification caused by the introduction into these reports, in 1897, of a new nomenclature of diseases. In the present report a comparison with the average of the last six years has been instituted, and a yearly increment will be adopted in each future report until a period of ten years shall have been again attained.

The invaliding ratio of the total force—namely, 24.03 per 1000—shows a decrease of 5.93 as compared with 1902, also a decrease of 6.94 in comparison with the average for the last six years. The highest invaliding rate was on the North America and West Indies stations. As regards the death rate, the ratio per 1000 was 4.19, showing a decrease of 1.73 per 1000 compared with 1902, also a decrease of 1.49 when contrasted with the last six years' ratio. The highest death rate appears on the East Indies station. The total death rate (4.19) is the lowest recorded since 1856. The death rate from disease alone was 2.79 per 1000, which is .72 less than the previous year.

The total force serving afloat in 1903 was 103,100. Of these 60,510, or 58.69 per cent, were between 15 and 25 years of age; 32,940, or 31.94 per cent, were between 25 and 35 years of age; 8310, or 8.06 per cent, were between 35 and 45 year of age; 1340, or 1.29 per cent, were 45 years and upwards. The total number of cases of disease and injury entered on the sick list was 85,735, which is in the ratio of 831.57 per 1000, being a decrease of 29.56 per 1000 when compared with the previous year. The average number of men sick daily was 3633.54, giving a ratio of 35.24 per 1000, and showing a decrease of .13 per 1000 compared with 1902, and of 1.56 in comparison with the last six years' average. The total days' sickness on board ship and in hospital was 1,326,244, which represents an average loss of service from disease and injury of 12.86 days for each person, which is .05 below the ratio of the previous year. The total number of persons invalided was 2478, which is in the ratio of 24.03 per 1000, and shows a decrease of 5.93 per 1000 when compared with 1902. Of the above total 1757 persons were finally invalided from the service, giving a ratio of 17.04 per 1000 for the whole force, or 70.9 per cent of the number invalided, thus showing a decrease of 3.7 per 1000 when contrasted with 1902. The largest increase—namely, 8.23 per 1000—was on the North America and West Indies station, but a decrease amounting to 17.23 per 1000 appears in the invaliding rate of the Southeast Coast of America station. The number of deaths was 433, which gives a ratio of 4.19 per 1000, and exhibits a decrease of 1.73 per 1000 in comparison with the previous year, also a decrease of 1.49 per 1000 on the last six years' average. The average number of entries on the sick list for disease and injury per man was, on the Home station, .82; Mediterranean, .68; North America and West Indies, .98; Southeast Coast of America, 1.06; Pacific, .76; Cape of Good Hope and West Coast of Africa, 1.1; East Indies, 1.12; China, .89; Australia, .68; and irregular force, .96. In the total force the average per man was

.83, a decrease of .03 in comparison with 1902. The Mediterranean station shows the lowest sick rate and the irregular force the highest. The ratio per 1000 of men sick daily on the various stations was, on the Home station, 38.43; Mediterranean, 24.71; North America and West Indies, 37.1; Southeast Coast of America, 41.05; Pacific, 27.52; Cape of Good Hope and West Coast of Africa, 36.05; East Indies, 36.72; China, 32.14; Australia, 30.08; and the irregular force, 43.63. The average ratio of sickness for the total force was 35.24 per 1000, which is a decrease of .13 per 1000 as compared with the preceding year.—*United Service Gazette.*

One of the first results of the new distribution of the fleet, to which full reference is made elsewhere, is seen in the Admiralty instructions to the newly-constituted Particular Service Squadron. The first cruise of this force will begin early in the new year, most of the vessels starting from Devonport, the base of the squadron, and proceeding to Dominica, where the remainder of the squadron under the flag of the commander-in-chief of the present North America and West Indies station will be met. The vessels which will start from home waters are the Hawke, which has relieved the Northampton as training ship for boys; the Gibraltar, which has replaced the Calliope; the St. George, which takes over the boys from the Cleopatra; the Highflyer and Isis, these two last being, of course, the tenders to the Dartmouth training establishment. The Hawke will be the senior ship of the division, and Captain A. J. Horsley will be in command until Vice-Admiral Bosanquet, in the Ariadne, meets them at Dominica in the second week in February. As we pointed out before, this new Training, or Particular Service squadron, will be a practically homogeneous force, capable not only of taking long cruises, but of being utilized as a powerful adjunct to a battle-fleet in time of emergency.—*Army and Navy Gazette.*

THE NAVAL MANEUVERS OF 1905.—We have received from the Admiralty the following "General Idea of the Maneuvers of 1905":

GENERAL MEMORANDUM.

Admiralty, January 2, 1905.

It is intended, during the summer of 1905 to carry out a series of maneuvers to represent the condition of affairs which might exist at a period when the relations of this country with some hypothetical power or powers had become so seriously strained that an outbreak of hostilities was possible at any moment.

During such a period, although no general mobilization (including the calling out of the reserves) might as yet have taken place, it would still be the duty of all British squadrons in commission to keep touch with the ships or squadrons of the hypothetical enemy, ready to act at a moment's notice. This touch should usually be maintained by cruisers, which would transmit their information to the battle-fleets by whatever means of communication were available, the battle-fleets themselves remaining in the vicinity of some central strategic position.

To carry out this idea three specially-formed skeleton squadrons and certain single-detached ships will represent the hypothetical enemy under the title of the Red side. Two of these squadrons will carry out a series of movements in European waters or the West Atlantic, while the third will probably make for a more or less remote destination. The single ships will move independently near the trade routes.

All British fleets in commission, with the exception of the vessels detailed to the Red side, will form the Blue side, and, on receipt of telegraphic orders from the Admiralty, will immediately make themselves acquainted with the whereabouts of the Red squadrons, and take the necessary steps for keeping in touch with them and for effectively dealing with them should war at any moment be assumed to have broken out.

The maneuvers will extend to all stations abroad as well as to those near home, and they will continue on these lines until directed to cease by telegraphic orders from the Admiralty.

It is intended that the maneuvers of 1906 shall be a continuation of the above idea, and that they shall reproduce as closely as practicable the strategy and tactics which would be employed after war with the hypothetical enemy had actually broken out.—*United Service Gazette.*

The *Moniteur de la Flotte*, discussing the redistribution of the British fleet, says it is impossible not to recognize the importance of the movements contemplated, and of the great precautions we are taking in a time of general confidence. It is pointed out that this change would make it impossible for France, in case of hostilities, to concentrate her Northern and Mediterranean squadrons, inasmuch as we could place sixteen battleships in the Mediterranean, or twenty in the Atlantic. The writer in our contemporary seems not to be aware that the changes which are taking place have no special relation to the events of the present hour, but are the crown and completion of a policy which has been in operation for some years, and which has for its object to place the fleet in the best posture for efficiency. There is, therefore, no aspect of hostility in the changes that are being made. The writer of the *Moniteur* would, however, like to see the French Northern and Mediterranean squadrons permanently concentrated in the Mediterranean. The present arrangement is pronounced to be strategically unsound. The *Yacht* is content to regard the redistribution as in harmony with the new conditions of European policy—the *entente cordiale* between England and France and the weakening of Russian naval power on the one hand, and the rapid growth of the German fleet on the other.—*Army and Navy Gazette.*

The important step with regard to the submarine defences at the naval ports foreshadowed some little time since by Mr. Arnold-Forster, has, we are pleased to see, been taken. The submarine mine defences at Portsmouth, Sheerness, Plymouth, Queenstown, and Milford Haven will be abolished, and the establishments connected with them will be taken over by the naval officials for conversion into submarine boat stations. The submarine mining vessels and other plant will, at the same time, be taken over by the Admiralty and utilized for other purposes. The minefield at Berehaven is also to be abolished. The result will be a gain all round, and not the least to the army by a saving in useless expense. While the arrangement does not for the present affect any other ports in the United Kingdom and in the Colonies, which include submarine mines in their defensive arrangements, it would be well worth the consideration of the authorities as to whether a further saving could not be effected in the same direction. It is a good principle to act on in this connection that all defence below high-water mark should be entrusted to the navy, or at least, that here the naval view should be considered of paramount importance.—*Army and Navy Gazette.*

The Admiralty has ordered that the battleships of the Atlantic fleet before proceeding on their first cruise shall be fitted with complete installations of wireless telegraphy. The system in the navy has now reached such a state of perfection that ships on detached service will be able to keep in touch with their flagships at a much greater distance than has been possible hitherto, thereby increasing the tactical area of operations. Several cruisers are also to be similarly equipped to add to their efficiency when scouting beyond ordinary signalling range.—*United Service Gazette.*

THE DISTRIBUTION AND MOBILIZATION OF THE FLEET.

Précis of First Lord's Memorandum and the Circular Letter from the Admiralty to Commanders-in-Chief:

1. THE EFFECTIVE WAR-FLEET.

The whole of the effective war-fleet will henceforth consist either of:

a. The fleet in commission at sea, or
b. The fleet in commission in reserve.

It follows from this broad definition, first, that all ships of little or no fighting value will be put out of commission at once and written off the effective strength of the navy, with the exception of such few ships as may still be required for the adequate performance of the peace duties of Imperial police, though the greater part of these duties, together with that of showing the flag in imposing force on suitable occasion, will henceforth be discharged by some one or other of the powerful cruiser squadrons now to be organized; and, secondly, that a similar policy will be adopted in respect of ships of light character now in the reserve. They will not be repaired nor reckoned for mobilization, but will gradually be disposed of "as my Lords may hereafter determine."

2. DISTRIBUTION OF THE FLEET IN COMMISSION AT SEA.

In accordance with the ancient and appropriate nomenclature, the present so-called Home fleet is henceforth to be known as the Channel fleet, and to consist of 12 modern battleships and a sufficient number of attendant cruisers. Its headquarters will be at home, and its station the home waters.

The present Channel fleet is henceforth to be known as the Atlantic fleet. It will consist of eight modern battleships and a proper complement of cruisers. Its permanent base will be Gibraltar, and all its repairs will be effected there.

The Mediterranean fleet will consist of eight modern battleships and a proper complement of cruisers. Its base will still be Malta, and all its repairs will be effected there.

In European and Atlantic waters there will be four cruiser squadrons. The first and second will each consist of six armored cruisers and will be affiliated to the Channel and Atlantic fleets respectively, but will be detachable on occasion for independent exercises and cruises.

The third will consist of the large cruisers on the Mediterranean station, and will bear the same relation to the Mediterranean fleet that the first and second squadrons are to bear to the Channel and Atlantic fleets, respectively.

The fourth will be a "Particular Service Squadron," with the Atlantic for its cruising ground, and its headquarters, when at home, at Devonport. It will be placed under the command of the commander-in-chief of the present North America and West Indies station, and will consist of his flagship together with other "valuable modern ships" allocated in peace time to the training of cadets and boys, but capable in time of war of immediate transformation into effective fighting units by the removal of the cadets and boys under training, and the completion of the crews "with the small additions required for war." The more advanced training services will also be carried on in sea-going modern cruisers affiliated to the Gunnery, Torpedo, and Navigation Schools, and capable of immediate adaptation to war purposes in any emergency.

This completes the enumeration of the fighting fleets at sea in European and Atlantic waters. The South Atlantic squadron will disappear. The North American squadron will be transformed, and its headquarters will be transferred to this side of the Atlantic; but the whole of the North Atlantic, especially its more western and southern latitudes, will be its regular cruising and training ground.

In extra-European waters the present China, Australia, and East Indies stations will be retained, such battleships as are required being allotted, as at present, to the China station, while the cruisers of the three stations, though attached to their respective stations in time of peace, will in time of war be placed at the disposal of the commander-in-chief of the China station, who will be responsible for their strategic distribution: "so that they may at the earliest possible moment deal with all the ships of the enemy to be found in those waters." These three cruiser squadrons will thus form an Eastern group, just as the three extra Mediterranean cruiser squadrons in the Atlantic and home waters will form a Western group. A fighting squadron will be retained on the Cape of Good Hope station, and will form "a connecting link between either the Eastern group and the Mediterranean cruisers or the Eastern group and the Western group." The present Pacific station, already disestablished, will remain in abeyance. Thus the commander-in-chief in China will in effect become the admiral of the whole Pacific.

3. ORGANIZATION OF THE FLEET IN COMMISSION IN RESERVE.

All the effective fighting ships which are not at sea will, nevertheless, be in commission in reserve, and available either for reliefs or for reinforcements. Each ship not undergoing a refit of long duration will have its nucleus crew, consisting of the most important ranks and ratings. That is, she will have a captain, a second in command, and a proportion of other officers, including the engineer, gunnery, navigating and torpedo officers, together with two-fifths of her war complement, including all the more expert ratings, especially torpedo ratings and the principal gun numbers. These will all serve in her when she is ordered to sea, and, with her nucleus crew and permanent staff of officers, she will go to sea periodically for gunnery practice and machinery trials. When mobilization is ordered, she will be completed with a full crew, consisting of 50 per cent of active ratings and 50 per cent of reserves, but to the latter will be assigned duties and stations which do not demand either the highest skill or the most recent training; they will, in fact, be practically sea-laborers. The ships of this category in each naval port will be formed into squadrons, each under a flag officer who will command them in time of war and be directly responsible for their fighting and seagoing efficiency. Thus, when occasion arises, they will all be ready to go to sea in full organization and efficiency as soon as the crews have been made up to full complement in the manner above indicated.

In addition, six modern battleships and six modern cruisers, two of each in each naval port, all forming part of the fighting reserve, and, therefore, all having permanent nucleus crews as above described, are to be told off as "emergency ships." Provision is made for filling these ships up at any moment to full complement from the floating surplus of *personnel* without dislocating the general arrangement for mobilization. These twelve ships would thus be the first reinforcement of the fighting fleets at sea, to be sent to sea at a few hours' notice in case of a sudden emergency. If the emergency became more acute, they would be followed at the shortest possible interval by all the ships in commission in reserve, made up to their full complements by the ordinary process of mobilization. Behind all these there will be nine other battleships in special reserve without nucleus crews, which, if required, could be manned in due course of mobilization with one-third active service ratings, one-third Royal fleet reserve, and one-third Royal naval reserve. This is the only element of the fighting fleet of the future which will continue to be mobilized more or less after the present fashion. All the rest will be mobilized henceforth on the basis of continuous commissions and permanent nucleus crews.

4. RELIEFS, REPAIRS, AND REFITS.

All ships in commission at sea will be commissioned for two years only, and will retain their officers and crews as far as possible unchanged for that period. It follows that half the fleet in commission will be relieved annually, being either recommissioned with entirely new crews, or relieved by exchange of places with ships in commission in reserve. Ships of the Mediterranean and Atlantic squadrons will return to England to recommission; those on other foreign stations will be recommissioned at some port about midway between England and their station.

Under the system of two-year commissions it is provided that no ship is to be in dockyard hands for more than thirty working days in all in each year. In ordinary circumstances, ships which go into harbor to refit will be subject to the condition that they are to be ready for sea in cases of emergency at fours days' notice. If any longer period is required for refit, the crew may be ordered to turn over to another ship, and will be ordered to do so if the refit will take more than thirty days. In no case will more than two battleships from the Channel fleet or more than one battleship from either the Mediterranean or the Atlantic fleet be permitted to undergo refit at the same time. The same principles are to be applied to armored cruisers in commission at sea. Periodical refits of a larger character are to be provided for, the ships affected being put out of commission for the time and their place being taken in the fighting line by other ships.

5. THE SYSTEM TO BE TESTED.

This scheme of reorganization is to be tested in 1905 and 1906 by a system of progressive maneuvers taking place simultaneously all over the world, in which as close an approximation to the conditions of actual war will be aimed at as is consistent with a state of peace. The commanders-in-chief and other flag officers all over the world will have to act throughout on their own initiative, to concert plans beforehand for mutual support, and to be responsible for continuous mutual co-operation.

6. NEW DESIGNS.

With regard to ships hereafter to be built, the types and classes required, and the features to be embodied in them, a special committee on designs is to be appointed at once "in order temporarily to assist the board and the director of naval construction in the elucidation of the problems involved." The board will first lay down "as a basis what they consider to be the fighting requisites of the desired types of war vessels and the governing features of each type to which the other features shall be subservient."

7. EFFICIENCY AND ECONOMY.

Finally, the First Lord remarks: "That the scheme will greatly increase the fighting efficiency of the fleet there can, I think, be no doubt; it will also, I am happy to say, result in a very considerable economy on the navy estimates."—*Times.*

THE FIRST LORD'S MEMORANDUM.

The First Lord's Memorandum, entitled, "Distribution and Mobilization of the Fleet," which is issued as a Parliamentary paper [Cd. 2335], and in which we have inserted cross-headings to facilitate reference, is as follows:

"The Board of Admiralty have decided to make certain changes in the distribution of the fleet and in the arrangements for its mobilization, the nature and reason of which I desire to explain.

A NEW STAGE IN NAVAL EVOLUTION.

"A new and definite stage has been reached in that evolution of the modern steam navy which has been going on for the last thirty years, and

that stage is marked, not only by changes in the *matériel* of the British navy itself, but also by changes in the strategical position all over the world arising out of the development of foreign navies. In the Western Hemisphere the United States are forming a navy the power and size of which will be limited only by the amount of money which the American people choose to spend on it. In the Eastern Hemisphere the smaller but modern navy of Japan has been put to the test of war, and has not been found wanting. The Russian navy has been greatly increased, and (with the exception of the fleet in the Black Sea) has been wholly transferred, or is in course of being transferred, from the Baltic to the Pacific. The navies of Italy and Austria-Hungary maintain their positions in the Mediterranean, but they have not been the subject of such increased expenditure as those of other powers. The French navy stands, as always, in the forefront. The new German navy has come into existence; it is a navy of the most efficient type, and is so fortunately circumstanced that it is able to concentrate almost the whole of its fleet at its home ports.

MODERN BATTLESHIPS AND ARMORED CRUISERS.

"In the British navy all the older battleships have been replaced by modern ones, so that it may now be said that all the battle-fleets in commission are composed of modern battleships. This fact in itself marks a distinct stage in the evolution of the *matériel* of the navy; but still more significant and far-reaching in its consequences is the fact that this country is now rapidly becoming possessed of a number of modern armored cruisers. When the Devonshire class are completed during the course of next year there will be in commission or in the reserve four Drakes, six Cressys, ten Monmouths, six Devonshires, or in all twenty-six armored cruisers. These are not all perfect ships, and many subsequent improvements can be made in the types represented, but they are nevertheless a great advance on anything which has preceded them, and they bring in their wake a revolution in respect of the composition of our cruiser squadrons.

"The features in these ships, which differentiate them from anything that has preceded them, are their great speed, which enables them at will to overtake any vessel of inferior speed or to escape from any vessel of superior power, their armor, which gives security to the men who fight the guns and to the vitals of the ship, and their armament, which in some cases is as powerful as that of the older battleships. With such ships even the best so-called 'protected' cruisers would engage at a considerable disadvantage, and the slower or smaller 'protected' cruisers and all unprotected cruisers would be hopelessly outmatched; their only hope of safety would be in flight, and they could not flee because they have not the necessary speed. The revolution has come suddenly; four years ago there was not one such ship in commission; within a year from this time the number in commission or in the reserve will be twenty-six.

"The principles, on which the present peace distribution of His Majesty's ships and the arrangement of their stations are based, date from a period when the electric telegraph did not exist, and when wind was the motive power, and it is a wonderful testimony to the strategical and political soundness of those principles that they have stood the test of time and met all the needs of the service up to the present moment.

"In the opinion of the Board of Admiralty, however, the new conditions described above have necessitated a review and readjustment of this distribution of ships and arrangement of stations.

PRINCIPLES OF NAVAL CONSTRUCTION.

"In the study of this question the board have endeavored to benefit by the experience of the navies of Japan and of Russia in the present war, and by the same light to review the principles on which the different classes of modern warships are constructed, and the features embodied in

them. In order temporarily to assist the board and the director of naval construction in the elucidation of the problems involved, it has been decided to appoint a special committee on designs which will be composed of naval officers and scientific and professional experts, and will begin work early next year, the Board of Admiralty first laying down as a basis what they consider to be the fighting requisites of the desired types of war vessels and the governing features of each type to which the other features shall be subservient.

DIFFICULTIES OF MOBILIZATION.

"They have also at the same time endeavored to overcome certain difficulties with which they have long been confronted in matters of mobilization. It will have been noticed that, whenever a portion of the fleet has been specially commissioned for maneuvers, the only difficulties which have occurred during these maneuvers have been in connection with the ships so specially commissioned. The arrangements in connection with the *personnel* have worked smoothly and quickly, and the ships have been commissioned and have proceeded to sea within the specified number of hours, but during the maneuvers the number of small mishaps in connection with the machinery of the specially commissioned ships has always been much in excess of that of the ships in commission. There has, however, never been any mystery as to the cause of this distinction. During the great expansion of the fleet which has been taking place for the last fifteen years the Board of Admiralty have never been able to retain at home a proportion of the *personnel* of the navy sufficient to keep the ships of the fleet reserve in such perfect condition that on mobilization for war they could feel confident that there would be no mishaps to the machinery on first commissioning, nor have the newly commissioned crews had sufficient opportunity to acquaint themselves with the innumerable details which go to make up what may be called the individuality of the ship. Year after year the board have endeavored to remedy this evil by proposing to Parliament large additions to the *personnel* (additions which Parliament has freely granted), but the increase in the number, size, and horsepower of the ships in commission has more than swallowed up the increase in the *personnel*, and consequently an adequate provision for the ships in the fleet reserve has not yet been made. It is not to be supposed that the importance of this matter has for one moment escaped the attention of the board; the mishaps referred to are almost always such as can be repaired in the course of a few days, certainly always in the course of a few weeks; but it is not possible to exaggerate the importance of having the whole fleet ready for war in the sense of being ready to deal an immediate blow—of having ready, in short, an instrument which in its every part will command the confidence of the admirals who have to use it, and of assuring the admirals in their turn that they have in their hands an instrument which will in no single point fail them. Hitherto, moreover, the firing practice of mobilized ships has left much to be desired; but as the guns' crews had not previously been associated together, more could not have been expected.

"The board have endeavored, and I believe successfully, to deal with these questions simultaneously. The ideals which the Board of Admiralty have always had before them have been that the peace distribution of the fleet should be also its best strategical distribution for war, and that the mobilized ships should be in as perfect a condition of fitness for war as the commissioned ships. They now hope while maintaining the first ideal to realize the second, and at the same time to withdraw as far as possible from peace commission those vessels which, however useful in peace, would in war be found to be of inferior fighting efficiency or even a source of weakness and anxiety to the admiral.

THE CHANNEL FLEET.

"The present Home fleet will change its name and henceforth be called the Channel fleet. It will have its headquarters at home, and will consist of twelve battleships and a sufficient number of attendant cruisers. It will be commanded by a flag officer of the rank of admiral, or, if he has not yet arrived at that substantive rank, of the acting rank of admiral; the second in command will be a vice-admiral, the third a rear-admiral.

THE ATLANTIC FLEET.

"The present Channel fleet will be renamed the Atlantic fleet, and will be permanently based on Gibraltar. It will consist of eight battleships and a sufficient number of attendant cruisers. The flag officer in command will hencefoward be styled 'commander-in-chief of the Atlantic fleet,' and he will be a vice-admiral or hold the acting rank of vice-admiral; the second in command will be a rear-admiral.

CRUISER SQUADRONS.

"Affiliated to the Channel and Atlantic fleets will be cruiser squadrons, each under the command or a rear-admiral, and consisting of six armored cruisers. The first cruiser squadron will be affiliated to the Channel fleet and the second cruiser squadron to the Atlantic fleet. These cruiser squadrons will, however, be detachable from the fleets to which they are affiliated either for special cruiser exercises or for special cruises.

"Under this arrangement the present separate South Atlantic squadron will be no longer required and will disappear.

THE MEDITERRANEAN FLEET.

"The Mediterranean fleet will consist of eight battleships with a sufficient allowance of cruisers. It will, of course, remain based on Malta, and the commander-in-chief will be of the rank of admiral or hold the acting rank of admiral; the second in command will be a vice-admiral. The large cruisers attached to the Mediterranean station will be known as the third cruiser squadron; they will be commanded by a rear-admiral, and will be occasionally detached for the same special reasons as in the case of the other squadrons.

REPAIRS.

"All the repairs of the Channel fleet will be done in the home dockyards, those of the Atlantic fleet at Gibraltar dockyard, and those of the Mediterranean fleet at Malta dockyard; the aim of the board will be to ensure that in the case of the Channel fleet never more than two battleships, and of the Atlantic and Mediterranean fleets never more than one, shall be in dockyard hands at the same time.

COMBINED EXERCISES.

"The Atlantic fleet will be put under the orders of the commander-in-chief of the Mediterranean fleet twice a year, and under the orders of the commander-in-chief of the Channel fleet once a year, for combined exercises.

"I hope to deal with the question of the allotment of battleships to the China station in my memorandum on the navy estimates.

CRUISERS IN EXTRA-EUROPEAN WATERS.

"The cruisers working in extra-European waters will be divided into three groups. The Eastern group will comprise the cruisers of the China, Australia, and East Indies stations. The responsibility will rest on the commander-in-chief of the China station for the strategical distribution of those cruisers in time of war, so that they may at the earliest possible

moment deal with all ships of the enemy to be found in those waters. The Cape of Good Hope squadron will be a connecting link between either the Eastern group and the Mediterranean cruisers or the Eastern group and the western group. The Western group of cruisers will consist of the cruisers under the command of the commander-in-chief of the North American and West Indian station and the mobilized cruisers with which he will be reinforced in time of war. At present the cruisers under the command of the commander-in-chief of the North American and West Indian station consist of his flagship, a first-class protected cruiser, and certain second and third-class cruisers. The board have decided to withdraw from the station the less effective of those ships and to add to it the ships of the new particular service squadron which they have decided to constitute, and of which the commander-in-chief of this station will be given the command.

THE TRAINING OF CADETS AND BOYS.

"Up to the present time the cadets from the Britannia in the second-class cruiser Isis and in the old armored cruiser Aurora, the youths in the Northampton and her tenders the Calliope and Cleopatra, and the boys in the Iris, Medea, and Medusa have all carried out their training afloat independently. It has been decided to transfer them all to valuable modern fighting ships, and to combine them into one squadron for training under the present commander-in-chief of the North American and West Indian station. They will make periodical returns to England, but the climate of the North American and West Indian station, extending as it does from the pole to the equator, will give the admiral in command opportunities of organizing their training under better climatic conditions than can be found anywhere else. The particular service squadron will therefore consist of the Ariadne, flagship; St. George, Hawke, Gibraltar, Isis, Highflyer, and other vessels not yet appropriated. In time of war it will only be necessary to remove from those ships cadets or youths or boys still under training and to complete the crews with the small additions required for war.

SHIPS' COMMISSIONS REDUCED TO TWO YEARS.

"At present a ship is commissioned for three years, and this system prevails on all stations except those which are under the system known as home sea service. In the present Home fleet, the present Channel fleet, and the present cruiser squadron the ships are not commissioned for any definite period, but being within the category of home sea service are in a state of continuous commission, twenty-five per cent of their crews being withdrawn every six months, and fresh entries from the depots, generally the youngest and last-entered seamen, taking their place. Even with ships in commission for three years the changes among the officers and men have been a constant and recognized evil, though, owing to the expansion of the fleet, which has rendered it necessary to make constant calls on the ships afloat for ratings to be promoted or to attend the gunnery and torpedo schools, it has hitherto been an unavoidable one. It will, however, be readily believed that these changes have added greatly to the difficulties of the officers in keeping their ships efficient, especially in matters of gunnery. Greater still have been the difficulties which have confronted the officers of the present Home fleet, Channel fleet, and cruiser squadron, where the systematic changes of twenty-five per cent every six months have been additional to the constant changes due to the general causes mentioned above, and the excellent results nevertheless produced deserve public recognition. The board have now decided to adopt a new system, and to reduce the period of all commissions to two years. This system will be gradually applied to all vessels in commission, including the new Channel and Atlantic fleets and the cruiser squadrons. When a ship has once been commissioned under this system no officer or man will

be removed from her for any avoidable cause, and the only drafts which she will receive will be those required to make good unavoidable waste. At the same time, the distinction between foreign sea service and home sea service will be abolished, and the only conditions of service which will be recognized are home service and sea service, *i. e.*, service in the home ports or ashore and service afloat.

THE FLEET RESERVE.

"The following is the plan adopted for the reorganization of the fleet reserve. The fighting ships will be organized quite separately from the obsolete or non-fighting ships. They will each have a captain, a second-in-command, and a proportion of the other officers, including engineer, gunnery, navigating, and torpedo officers. They will have a nucleus crew of two-fifths of their war complement, but in that two-fifths will be included all the more expert ratings, especially the torpedo ratings and the principal gun numbers, and each ship will periodically proceed to sea for the purpose of gunnery practice and of testing her machinery. They will be grouped homogeneously at the three home ports according as their destination may be determined for reinforcement in time of war. Each group so formed will be commanded by a flag officer, who will himself take the reinforcements in time of war to the fleet which they are to reinforce, and he and he alone will be held responsible that every possible step has been taken to reduce breaksdown of machinery to a minimum, and that the fighting efficiency of his ships, when mobilized, is without flaw. In addition, there will be a sufficient margin of ratings kept at home to enable the board to commission an emergency squadron without dislocating the schools or nucleus crews or having recourse to a general mobilization.

THE FORTHCOMING MANEUVERS.

"The maneuvers both in 1905 and 1906 will be directed to the testing of this scheme of reorganization. In 1905 movements of the fleet in commission and of a few mobilized ships will take place all over the world in view of hypothetical strained relations with an imaginary power; in 1906 the supposition will be that war has actually broken out some weeks after the period of strained relations, and the reserve squadrons at the home ports will be actually mobilized, and will proceed under their respective rear-admirals to reinforce the fleets to which they have been previously affiliated. The hostile fleets will be represented next year by various big cruisers (as a skeleton enemy), which will start on unknown dates from unknown places to represent the movements of the imaginary power. The commander-in-chief and other flag officers all over the world will have to act throughout on their own initiative; they will be responsible for keeping a continuous touch with the enemy and for continuous mutual co-operation; they will concert together beforehand their plans for mutual support, and the port admirals and other stationary officers must instantly comply with the requests of the admirals at sea. In no case will references to the Admiralty be permitted.

"It has been already stated that the cadets, youths, and boys under training are being transferred to modern fighting vessels. Similar action will be taken in the case of the more advanced training services, where modern cruisers will be substituted for the older ones at present acting as schools for navigation or as tenders to the gunnery schools.

"In order to provide the *personnel* for all these purposes a certain number of ships of comparatively small fighting value have been, or will be, withdrawn from commission, but care has been taken to leave enough ships on every station for the adequate performance of what I may call peace duties of Imperial police, and the four cruiser squadrons will be employed to show the flag in imposing force, wherever it may be deemed to be politically or strategically advisable.

THE SINGLE OBJECT IN VIEW.

"In the reorganization, a sketch of which I have given above, the board have had but one object in view, and that is that on a declaration of war the fighting efficiency of the fleet shall be complete and instantaneous. That the scheme will greatly increase the fighting efficiency of the fleet there can, I think, be no doubt; it will also, I am happy to say, result in a very considerable economy on the navy estimates."—*"Selborne."*

THE NEW RESERVE FLEET.—Under the new reorganization scheme, the fighting fleets of the navy are now organized as under:

a. The fleets in commission at sea, including the twenty-eight battleships and eighteen armored cruisers of the Channel, Mediterranean, and Atlantic fleets, and the three cruiser squadrons; the five battleships of the China squadron, and the various "groups" of protected cruisers.

b. The fleet in commission in reserve, comprising the vessels of the reserve divisions established recently, and including the following vessels:

Battleships	9
Cruisers	20
Torpedo-gunboats	2
Torpedo-boat destroyers	42
Torpedo-boats	43

Six of these battleships and six of the first-class cruisers are held in readiness to proceed to sea at once on an emergency, and the others would follow at short notice; in fact as soon as their crews had been completed to war strength.

In addition to the above, a number of less valuable vessels, mostly obsolescent, remain at the naval ports, but not in commission. They could be prepared for sea at comparatively short notice in the event of their assistance being needed.

The new reserve divisions were commissioned on the 3d ult., on which day also the different rear-admirals, appointed to command them, hoisted their flags:

Devonport Reserve Squadron (commanded by Rear-Admiral C. G. Robinson).—Battleships, Barfleur (flagship), Hood, King Edward VII; cruisers, Blake, Niobe, Arrogant; torpedo-gunboat, Harrier; torpedo-boat destroyers, Arab, Avon, Bittern, Blackwater, Daring, Express, Ferret, Gipsy, Leopard, Lynx, Ostrich, Violet; torpedo-boats, Nos. 80, 81, 82, 85, 86, 87, 98, 99, 104, 105, 106, 107, 108, 111, 112, 113.

Portsmouth Reserve Division (commanded by Rear-Admiral R. L. Groome).—Battleships, Canopus (flagship), Prince George; cruisers, Europa, King Alfred, Powerful, Spartiate, Terrible, Eclipse, Indefatigable, Latona, Pandora; torpedo-boat destroyers, Bullfinch, Contest, Kestrel, Lightning, Recruit, Rocket, Star, Surly, Tiger, Vulture, Zebra, Zephyr; torpedo-boats, Nos. 25, 27, 33, 34, 41, 42, 45, 52, 53, 54, 55, 57, 58, 78, 79, 110, 114, 115, 116, 117.

Sheerness-Chatham Reserve Division—(commanded by Rear-Admiral W. H. G. B. Graham).—Battleships, Resolution (flagship), Goliath, Ramillies, Repulse; cruisers, Argonaut, Diadem, Scylla, Pegasus, Pioneer, Pyramus; torpedo-gunboat, Speedy; torpedo-boat destroyers, Charger, Dasher, Greyhound, Hardy, Haughty, Havock, Hornet, Hunter, Opossum, Racehorse, Ranger, Roebuck, Salmon, Snapper, Spitfire, Starfish, Sturgeon, Swordfish; torpedo-boats, Nos. 65, 66, 67, 68, 72, 73, 74.

THE MEDITERRANEAN FLEET, REDISTRIBUTION OF DESTROYERS.—The destroyers in the Mediterranean have been redistributed this month as shown below, four divisions working from Malta and one division from Gibraltar, as their respective headquarters. The object of the scheme is to have boats of similar build, as far as possible, in the same division, so that the

spare parts of the machinery and boilers will be interchangeable, thus reducing the number of parts a parent ship would have to carry for one division:

Distribution.	1st Division. River Class 25½ knots.	2d Division. Palmer's. 30 knots.	3d Division. Thornycroft's. 30 knots.	4th Division. Laird's. 30 knots.	5th Division. Mixed Class. 27 and 30 knots.
Working flotilla of five vessels in commission.	Exe. Erme. Ettrick. Itchen. Dee.	Kangaroo. Myrmidon. Fawn. Bat. Peterel.	Albatross. Desperate. Stag. Coquette. Foam.	Sprightly. Locust. Orwell. Griffon. Seal.	Mallard (30) Banshee (27) Quail (30) Earnest (30) Bruiser (27)
Reserve of three vessels.	Arun (M) Cherwell (M) Foyle (M)	Crane (M) Star (G) Flying Fish (M)	Cygnet (M) Angler (M) Cynthia (G)	Express (G) Lively (M) Panther (M)	Thrasher (G) 30 Dragon (G) 27 Ardent (G) 27
Additional 10 per cent Reserve.	Blackwater (M)	Flirt (M)	Ariel (M)	Wolf (M)	Boxer (G) 27

(M) Malta Reserve. (G) Gibraltar Reserve.
The 5th Division will be stationed at Gibraltar.

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Roma	12,625	Gov't Yard, Spezia.	Building.
Napoli.....	12,625	Gov't Yard, Naples.	"
X.....	12,625	Gov't Yard, Castellamare.	Projected.
Vittorio Emanuele ..	12,625	Gov't Yard, Castellamare.	Launched October 1, 1904.
Regina Elena.....	12,625	Gov't Yard, Spezia.	Launched June 19, 1904.
Armored Cruiser.			
Francesco Ferruccio.	7,490	Gov't Yard, Venice.	Under trial.

THE ITALIAN BATTLESHIP VITTORIO EMANUELE III.—On the 5th of October the first-class battleship Vittorio Emanuele III was successfully launched at Castellamare, in the presence of the King of Italy. With the possible exception of H. M. S. King Edward VII, there has not been a more discussed warship within recent years. As her *pros* and *cons* were thoroughly gone into in our issue of March 15, 1901, at the time when she was first projected, it will only be necessary to briefly enumerate her special features. First and foremost of these is the total abolition of the 6-inch gun, mounted in all Italian warships up to the Benedetto Brin, its place being taken by the 8-inch gun, with a reduction in the number of 12-inch guns from four to two. The special arrangement of these is something after the style of the Russian Tsarevitch, except that the amidships turret is a deck higher than the others instead of lower. Secondly, she has been given a designed speed of 22 knots, which will probably reach 23 on actual trial. Here we have a factor which at once eliminates the uncertain line between the battleship and armored cruiser. Larger and more powerful enemies like the Connecticut or Lord Nelson she could easily outdistance if unwilling to fight, while very few foreign armored cruisers could show her a "clean pair of heels."

As originally designed she was to have carried a battery of twelve 4-inch guns. These have now been altered to 3-inch 12-pounders, a distinct change for the better, as with practically equal destructive power against torpedo craft, a more rapid rate of fire can be maintained with the smaller gun.

In the following table it will be seen how she compares with the latest designs of the powers of her displacement or thereabouts:

	Italy. Vittorio Emanuele III.	Great Britain. Triumph.	France. Suffren.	Germany. Braunschweig.	Russia. Evstafi.	U. S. A. Idaho.
Date launched	1904	1903	1901	1902	Building	Building
Displacement	12,625 tons	11,800	12,728	13,200	12,600	13,000
Dimensions	435 × 73½ × 26	436 × 71 × 25	410 × 70 × 27	400 × 72 × 26	371 × 72 × 27	375 × 77 × 24
Armament—						
Main	2 12-in. guns	4 10-in.	4 12-in.	4 11-in.	4 12-in.	4 12-in.
Secondary	12 8-in.	14 7.5-in.	10 6.4-in.	12 6.7-in.	16 6-in.	8 8-in.
Tertiary	12 12-pdrs.	14 14-pdrs.	8 4-in.	12 15½-pdrs.	16 12-pdrs.	8 7-in.
Auxiliary	12 3-pdrs.	4 6-pdrs.	2 9-pdrs.	12 1-pdrs.	6 3-pdrs.	20 14-pdrs.
	4 Maxims	4 Maxims	24 3-pdrs.	8 Maxims	6 1-pdrs.	12 3-pdrs.
						8 1-pdrs.
Torpedo tubes (submerged)	4	2	4 (2 above water)	6 (1 above water)	3	2
Protection—						
Belt	10-in.—4-in.	7-in.—3-in.	12-in.—6-in.	9-in.—4-in.	9-in.—2-in.	9-in.—4-in.
Lower deck side	8-in.	7-in.	5-in.	5½-in.	6-in.	7-in.
Protective deck	4-in.	3-in.—1½-in.	3-in.	3-in.	3-in.	?
To big guns	8-in.	10-in.—8-in.	12-in.	11-in.	12-in.	12-in.
Secondary	6-in.	7-in.	5-in.	7-in.	5-in.	7-in.—6-in.
Indicated horse-power	20,000	12,500	16,200	16,000	10,600	10,000
Speed	22 knots	19 knots	18 knots	18 knots	18 knots	17 knots
Coal supply (maximum)	2800 tons	2000	1150 + oil	1500 + oil	900 (normal) + 580 oil	1750

Without a doubt, in the near future other nations will embody the general features of her design in their battleships. Already a monster 20,000-tonner is being projected in the United States of America, carrying only twelve 12-inch and a large number of 3-inch guns, with a speed of 20 knots or over, to all intents a replica of Col. Cuniberti's Ideal—dealt with in "Fighting Ships," 1903—whilst the Lord Nelson, with her four 12-inch and ten 9.2-inch guns, is practically a development of the Vittorio Emanuele on a larger scale.—*Engineer.*

On December 31, 1903, the active navy list included 21,324 men, the first reserve 25,431 men, the second reserve 8905; altogether 55,660 men. This year there will be 5000 men less.—*Le Yacht.*

The Italian budget for 1905-1906 amounts to 127,246,962 francs, of which 9,799,361 francs is for the merchant marine.

The following are the new works to be carried on:

The Regina Elena and Vittorio Emanuele to be completed and commissioned in 1906.

The Roma and Napoli to be launched in 1905.

Two armored cruisers, A and B, of 10,000 tons to be begun at Castellamare.

The submarines Glauco, Squalo, Narvalo, Tricheco, and Otaria to be completed at Venice, and two new submarines to be begun there.

Four destroyers of 380 tons and twenty-seven torpedo-boats of 210 tons to be built.

Furthermore, it seems probable that the Government will purchase the three armored cruisers of 10,000 tons now building at the works of Ansaldo, Odero & Orlando, and which ought to be finished by the beginning of 1906.—*Le Yacht.*

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Kashima.....	16,500	Elswick.	Launched Mar. 23, 1905.
Katori.....	16,500	Vickers.	Building.
Armored Cruisers.			
1.....	12,000	Kure.	Projected.
2.....	"	"	"
3.....	"	"	"

It is announced from Tokio that the Naval Commission, basing its views upon the experiences of the present war, has pronounced in favor of the system of battleships of great displacement armed with heavy guns. The displacement of the new ships is to be raised to 19,000 tons, and the plans for this new type are already elaborated.—*Moniteur de la Flotte.*

In 1903 the Parliament voted two battleships, three armored cruisers, and one cruiser. The battleships are the Kashima, building at Elswick, and the Katori, being built by Vickers. One of the armored cruisers should now be building at Kure. Two others would have been given to an English firm. A new program, it appears, is in preparation. It is to be carried out altogether in Japan, and will comprise a battleship of 19,000 tons and 18¼ knots, armed with four 12-inch, twelve 10-inch, and twelve 4.7-inch guns, at Yokosuka; two armored cruisers with four 12-inch and six 10-inch guns at Kure. These latter ships will displace at least 12,000 tons, and all the ships will carry only large guns of great range. The 6-inch guns, so dear to the English, Japanese, and above all, to the Germans, will be rigorously excluded as too feeble in power.—*Le Yacht.*

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I.....	16,000	St. Petersburg (Baltic Yard).	Building.
Andrei Pervosvannui.....	16,000	St. Petersburg (Galerney Island).	"
Slava.....	13,516	St. Petersburg.	Launched Aug. 29, 1903.
Evstafi.....	12,500	Nicolaiev.	Building.
Ivan Zlatoust.....	12,500	Sevastopol.	"
Coast Defence Iron Clad			
Admiral Boutakof	6,000	St. Petersburg.	Building.
Protected Cruisers.			
Kagul	6,750	Nicolaiev.	Under trial.
X.....	6,700	"	Building.
Otchakof	6,750	Sevastopol.	Under trial.
X	6,750	"	Building.
Vitiaz	6,750	St. Petersburg.	"
X.....	6,750	"	"
Kalgoula.....	3,200	Nicolaiev.	Building.
7.....	3,200	Dantzic (Schichau).	Building.
8.....	3,200	St. Petersburg.	Projected.

"The Emperor has sanctioned the expenditure of £160,000,000 for rebuilding the Russian navy." In these bald words the St. Petersburg correspondents announced the new scheme for the replacing of the squadrons which Russia has lost in the war. The program is to cover ten years, and many of the vessels will be built abroad. The building program is to consist of eight battleships of the Kniaz Suvaroff type, eight of the Andrei Pervosvannui class, six armored cruisers, twelve protected cruisers, fifty destroyers, and one hundred torpedo-boats.

The Third Pacific squadron which is fitting out in great haste at Libau will take practically every remnant of the Russian fleet from European waters, with the exception of the Black Sea fleet, which is penned up behind the Dardanelles. Whether the squadron under Admiral Mebagatoff will be ready to start in another fortnight is doubtful, but urgent commands have been issued for it to do so.—*Page's Weekly.*

The great gravity of the naval situation having been brought home to the Russian Government, the Czar is stated to have sanctioned a ten-years' shipbuilding program, involving an expenditure of about £160,000,000. A naval committee has been investigating the question, with some procrastination, and it has been decided to build eight battleships of the Slava type and eight of the Andrei Pervosvannui type, six cruisers of the Bayan class, six improved Noviks, and six of the Bogatyr class, besides fifty large destroyers, one hundred various torpedo-boats, ten mining ships, and four floating workshops. The last destroyers built by the Nevsky yard are not at all satisfactory. About thirty destroyers are at present in hand in Russian, French, and German yards, and about twelve others will very soon be begun. It is also stated that the volunteer fleet will undergo a change, its headquarters being removed from Odessa to a northern port, probably Windau.—*Army and Navy Gazette.*

In view of our investigations regarding the relative advantage of the 25½ and 30-knot destroyers, it may be well to state that the new vessels to be built for the Russian navy—eleven in all, eight by the Société des Forges et Chantiers, and three by M. Normand, of Havre—will be 28-knot vessels, similar to those in use in the Far East. They will be 196 feet

long and of 300 tons displacement, carrying 80 tons of coal. The power of the propelling machinery is 5000 I. H. P. Italy, however, is going in for 26-knot boats of a new class, more resembling the British type, and sixteen of them are to be built by Schichau, of Dantzig, who built the former 30-knot boats for the Italian navy. France's later destroyers are of 28-knot speed.—*United Service Gazette.*

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Protected Cruisers.			
Reina Regente	5,372	Ferrol.	Building.
Isabel la Catolica	3,500	Canaca.	"

SWEDEN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Coast Defence Battleships.			
Oscar II	4,208	Stockholm.	Building.
Manligheten	3,650	Malmö.	Under trial.
Tapperheten	3,650	Stockholm.	"
Armored Cruiser.			
Fylgia	4,600	Stockholm.	Building.

The new Swedish ironclad Manligheten, built at the Kochum shipyard, Malmö, Sweden, had a most satisfactory trial trip in the Sound on November 1. The trial lasted five hours, and the contract speed was exceeded. The highest speed recorded was 17.08 knots, and the average speed of 16.08 knots; the engines indicating 7400 horspower.—*Nautical Gazette.*

The naval program of 1901, which was to have been completed by next year, has fallen so much in arrears that an increased grant has been asked for 1905, in order that the program may be completed in 1907. The following is the proposed allotment of this grant. The sums asked for are as follows: For completing the ironclad Oskar II, £140,100; first instalment new ironclad of Fylgia type, £123,000 (total cost, £385,700); completion of torpedo-boat destroyer, £33,400; two torpedo-boat destroyers, £133,500; first instalment five large torpedo-boats, £55,100; nine small torpedo-boats, £99,100; training vessel, £11,600; reconstruction of Loke, £29,800; reconstruction of Hildur, Bjorn, and Gerda, £28,050; three guard boats, £4,100.—*Page's Weekly.*

UNITED STATES.

VESSELS BUILDING.

No.	Name.	Speed. Knots.	Where Building.	Per cent. completed Mar. 1, 1905.
	Battleships.			
13	Virginia	19	Newport News.	80.8
14	Nebraska	19	Moran Bros. Co.	67.6
15	Georgia	19	Bath Iron Works.	75.1
16	New Jersey	19	Fore River Shipbl'g. Co.	77.9
17	Rhode Island	19	Fore River Shipbl'g. Co.	82.5
18	Connecticut	18	Navy Yard, New York.	67.2
19	Louisiana	18	Newport News.	69.5
20	Vermont	18	Fore River Shipbl'g. Co.	38.8
21	Kansas	18	New York S. B. Co.	43.5
22	Minnesota	18	Newport News.	58.7
23	Mississippi	17	Wm. Cramp & Sons.	22.6
24	Idaho	17	Wm. Cramp & Sons.	19.9
25	New Hampshire	18	New York Shipbl'g. Co.	0

VESSELS BUILDING.—*Continued.*

No.	Name.	Speed. Knots.	Where Building.	Per cent. completed Mar. 1, 1908.
	Armored Cruisers.			
4	Pennsylvania	22	Wm. Cramp & Sons.	100.0
5	West Virginia	22	Newport News.	96.8
6	California	22	Union Iron Works.	72.2
8	Maryland	22	Newport News.	97.5
9	South Dakota	22	Union Iron Works.	69.5
10	Tennessee	22	Wm. Cramp & Sons.	65.1
11	Washington	22	New York Shipbl'g. Co.	66.4
12	North Carolina	22	Newport News.	0.5
13	Montana	22	Newport News.	0.6
	Protected Cruisers.			
16	Chattanooga	16½	Lewis Nixon.	90.1
17	Galveston	16½	Wm. Trigg Co.	98.0
20	St. Louis	22	Neafie & Levy Co.	58.8
21	Milwaukee	22	Union Iron Works.	68.0
22	Charleston	22	Newport News.	92.0
	Gunboats.			
17	Dubuque	12	Gas Engine & Power Co.	88.2
18	Paducah	12	Gas Engine & Power Co.	78.6

SCOUT CRUISERS FOR THE UNITED STATES NAVY.—The Board of Construction has recommended that the three cruisers which were authorized at the last Congress be of the following dimensions:

Length, between perpendiculars	420 feet.
Breadth	46 feet 8 inches.
Draft, fully loaded	16 feet 3½ inches.
Depth, amidships	36 feet 5 15-16 inches.
Displacement, loaded	4310 tons.
Draft on trial	16 feet 10 inches.
Corresponding displacement on trial	3750 tons.
Speed	24 knots.

The battery is to consist of twelve 3-inch guns and two 21-inch submerged torpedo tubes, with 3600 rounds of the 3-inch ammunition, and eight torpedoes. The estimated weight of battery and full ammunition is 140 tons. Over the length of machinery space there is to be worked in an inclined nickel-steel deck 1½ inches thick, and a vertical steel protection deck 2 inches thick, extending above the tops of the boiler drums and cylinders of the main engines. At each end of the machinery space a thwartship nickel-steel bulkhead, 1 inch thick, is to be fitted. Nickel-steel armor, 2 inches thick, on the sides and 1 inch on the top, is to afford protection to that part of the steering-gear which is above the water-line. The total estimated weight of the nickel-steel armor is 205 tons.

Four endless-chain electric ammunition hoists are to be installed, two forward and two aft, for supplying the ammunition for the 3-inch guns, while for handling the boats and coaling, etc., it is proposed to install four electric deck winches. The anchors are to be handled by one steam capstan windlass, and the steering-gear is to be of the usual steam and hand type, with steering stations on the forward bridge and in the steering engine-room. The vessel is to be lighted throughout by electricity, which power is also to drive the ventilation fans, from a large central generating plant of sufficient capacity to operate under battle conditions. The other electric equipment includes two large search-lights and wireless telegraphy outfit.

Two alternate proposals for powering the ships will be called for. One, which is according to plans prepared by the bureaus, is to include twin-

screw reciprocating engines with necessary auxiliaries, with main engines designed to develop the maximum of about 16,000 I. H. P. on trial. Steam is to be generated by twelve water-tube boilers; besides the usual auxiliaries, there is to be an evaporating and distilling plant of 16,000 gallons capacity, a work shop, and refrigerating plant of two tons' capacity. The total weight to be allowed for machinery, including spare parts, is 794 tons. The alternate proposal will be for a vessel with the general characteristics of hull as set forth, but on the bidders' design of machinery, preference being given to a turbine installation, other things being equal.—*Marine Engineering.*

Secretary Morton has made contracts with the Electric Boat Company, of Bayonne, N. J., for two Holland submarine torpedo-boats of the latest design. The characteristics of these ships have not yet been finally determined. The aggregate cost will be $400,000, and will use up the last of the $850,000 appropriated by Congress for submarine warfare research, all of which has been spent for Holland boats, of which there are nine now in the service besides four contracted for within a month.—*Nautical Gazette.*

The U. S. armored cruiser Pennsylvania has made 22.5 knots on trial, thus beating the Colorado by .21 knots. The Colorado, it will be remembered, beat the Virginia. The Colorado has Niclausse boilers, the others have the Babcock. The fight between the American and French type boilers is very keen in the American navy, and "honors are easy," or nearly so, thus far, neither type having proved itself distinctly better than the other.—*Engineer.*

THE NEW PORTSMOUTH DRYDOCK.—The new stone drydock at the navy yard, Portsmouth, N. H., which has been under construction for four years past, has been completed. It is the biggest completed structure of its kind on this continent. Its total length from caisson to top of coping is 750 feet, the length on the floor being 728 feet. It has a width from coping to coping of 130 feet, and a width on floor of 80 feet, or 20 feet wider than the Charlestown dock, soon to be opened. At mean high water there is 30 feet of water over the sill of the dock and 33 feet at extreme high water. The sides of the dock are set against the rock backing, with concrete filling between, and, with the altar stones, are of very heavy granite. The bottom of the dock has a solidity that probably has never been exceeded in a structure of this kind. There are 144 keel blocks, the foundation being masses of granite four feet thick, set on concrete. The bilge blocks, ranged on either side, are seventy-two in number and are likewise solidly bottomed. Granite steps lead to the floor of the dock at various points, and the terraced effect of the sloping sides is broken by a number of smooth "slides," down which material may be tobogganed when needed. The steel caisson is of the double-end type, and contains the necessary tanks for its own flooding and raising, together with a 25-horsepower engine, with boiler and pumps. To flood the dock, water enters from the outside through 15-inch valves in the caisson to a sufficient extent to float the caisson, and then, the latter rising, the water comes into the dock from underneath in increased volume. To empty the dock three large pumps throw 43,000 gallons of water a minute and a small one 4500 gallons a minute, making a total of 133,500 gallons a minute. There is also in the pump well a 30-horsepower motor connected with a five-stage centrifugal pump, for opening and closing the three 45-inch pump valves and the 96-inch culvert gate. The pump well is fitted with two circular galleries, reached by stairways, and has a concrete floor. The motive power for the pump well is generated by a set of three boilers of 500 horsepower each, two 750-horsepower engines and continuous-current generators of 250 volts. Cables laid in concrete conduits convey the

electrical power to the pump well. The new drydock was flooded and pumped out on January 20 with the greatest success. The pumps worked perfectly and completely emptied the big basin in two hours four minutes and forty seconds. This is nearly thirty minutes inside the stipulations of the contract.

The collier Lebanon entered the new drydock on January 24 at 8.45 a. m. Everything worked smoothly and at 11 o'clock the basin had been entirely pumped out.—*Nautical Gazette.*

ORDNANCE AND GUNNERY. TORPEDOES.

A new naval gun has just passed satisfactorily through a series of trials at the Government proof-butts, Royal Arsenal, Woolwich, and a large number will shortly be manufactured for issue to the Royal navy. The gun will be known as the 12-pounder (18-cwt.) quick-firing wire gun, and will, it is understood, be a great improvement upon the existing 12-pounder (12-cwt.) naval gun. It will fire more rounds per minute with greater velocity, accuracy of aim, and higher range.

Cross-connecting sights are to be fitted to the 6-inch quick-firing guns of His Majesty's ships, both at home and abroad. The work on ships abroad is to be done by naval artificers, and that at home by dockyard workmen. These sights will enable the sight-setter to work on the opposite side of the gun-layer, and will thus admit of both sides being accurately adjusted.—*United Service Gazette.*

A letter from the China station states that Mr. G. B. Hazell, gunner, of the Astraea, has fitted a sight connection to one of the 6-inch guns, on the central pivot Mark I. mounting. This device enables the 2d captain of the gun to keep the gun on the target without orders from the captain of the gun, and also to see if the captain of gun's sight is aligned correctly on the target, both sides being connected for range and deflection, and, therefore, in the same adjustment. The value of this cross-sighting arrangement was proved during the annual prize-firing, one man making nine hits out of ten rounds at a range of 3000 yards. The target was of the ordinary service pattern.—*United Service Gazette.*

The report that the King Edward damaged her decks at her gun trials is correct. The deck aft was depressed 5 inches by the fire of the 9.2's.—*Engineer.*

Two explosions, at intervals of some days, have occurred recently in the magazine compartments of the French battleship Charlemagne. They are believed to be due to the decomposition of the powder, which has been kept in the vessel far beyond the regulation time.—*United Service Gazette.*

It is reported that designs are now being worked out to mount extra 9.2's in the Britannia class instead of 7.5's, which were ordered to replace the useless 6-inch guns originally intended to be fitted to these battleships. We sincerely hope that the report is true. An earnest of it is that no work is being done in the batteries at present.

A 1905 model target is about to be introduced experimentally in the naval war game. Instead of the old three-size targets there will be silhouettes for ranges up to 8000 yards. The idea is that it is better to train students of the game to something that looks as nearly as possible like the real thing. The 4000-yard target will be the same size as the *Fighting Ships'* ship, page silhouettes, so that the chances of hits at 8000 yards, the targets for which will be smaller in proportion, will be as small as they are in actual practice.—*Engineer.*

Military tops have been abolished in the battleships of the King Edward class, but gun-directing platforms have been fitted in their place. This change is said to be due to the initiative of Captain Percy Scott. The absence of the weight of guns and the protective plating at such a height above the center of buoyancy and gravity contributes greatly to the stability of the ship, without impairing in any appreciable degree her fighting efficiency, as the machine and quick-firing guns are now in elevated positions on the ship's hull.—*United Service Gazette.*

The Prince George has had her upper fore fighting top and after main one converted into the new range-finder positions. Small projections have been built out and roofs fitted to the tops treated. The appearance of the ship is correspondingly altered. All the other Majestics are to be similarly treated as they come into dockyard hands.—*Engineer.*

A new and important fitting is being placed in the battleship King Edward VII for the purpose of developing the rapidity of firing the guns of large caliber. It is practically a dummy gun, with a real breech-block attached and all the mechanism for passing the projectiles into the breech. The invention consists of a stout wooden frame, the breech end being covered with a thick steel plate, having a hole drilled, or, rather cut, out of its center the diameter of the projectile of the gun which it represents. The actual breech-block of the gun is attached to this. The barrel of the gun is represented by a half-cylinder of wood, cased with thin steel, and running at an acute angle from this is a return gutter of wood and steel, which brings back the projectile after it has been rammed through the barrel to the loading position. The projectiles are raised from the deck and placed in position by a whip leading from a radial arm, which derives its motor power from a hydraulic press. The dummies are fitted on the upper deck, and every motion is gone through in exactly the same manner as if the projectile were actually fired from the gun itself. These drills are calculated to bring the guns' crews up to the highest standard of efficiency in rapidity of loading; in fact, it is considered by gunnery experts that by this method of training guns above the caliber of 6-inch will closely approximate to the results obtained from the quick-firing guns. The cost of each dummy is estimated at £1500.—*United Service Gazette.*

In the 12-inch gun-layers' competition in the Channel fleet, the best shooting has so far been accomplished by the battleship Victorious, which scored thirty direct hits in fifty-six rounds. The Cæsar, flagship of Vice-Admiral Lord C. Beresford, has added to her records by taking on board from dockyard lighters at Gibraltar 600 tons of coal at an average of 212 tons per hour. This, it is maintained on board, is the best coaling ever made from lighters. The Mars, coaling from the Admiralty collier Sirdar, took in 700 tons at the rate of 166 tons per hour. The Cæsar at long-range firing has made seven hits out of twelve rounds with her 12-inch guns, while the Doris has made seventeen hits out of sixty rounds with her 6-inch guns, both performances being remarkably good.—*United Service Gazette.*

Lord Charles Beresford recently entertained eighty petty officers and men, the best shots in the Channel fleet, at a dinner at Gibraltar on the quarter deck of the flagship Cæsar. Addressing the men Lord Charles congratulated them on their excellent shooting in the gun-layers' competition, saying that the markmanship was a credit to the men and to the country. He alluded to the great improvement in straight shooting in the navy in the last four years, and added that though the ranges were greater this year, the scores were better than in 1903. The officers, gunnery lieutenants, and gunnery staffs had all worked loyally. He had kept a list of the names of all the best shots, and would always be pleased to

do anything he could to help them. Subsequently each man's score in the competition was read out. Lord Charles said he thought he was safe in claiming that His Majesty's ship Victorious had this year the best record in the world for 12-inch gun firing. The Cæsar was the best for 6-inch, 12-pounder, and 3-pounder. The Illustrious came out second in the 12-inch gun-layers' competition, firing forty-nine rounds in eighteen minutes and making twenty-nine direct hits. She is fitted with the slow-loading gear.—*United Service Gazette.*

The following results were obtained in a gun-layers' competition in the Channel fleet under Vice-Admiral Lord C. Beresford:

With her 12-inch guns the battleship Jupiter made nineteen direct hits out of fifty-six rounds, and with her 6-inch guns she scored no less than eighty-seven hits out of one hundred and sixty-two rounds. The commander-in-chief signalled his congratulations to the ship on the result. The battleship Hannibal's 12-inch gun-firing was disappointing, only nine hits out of forty-three rounds. With her 6-inch guns, however, she did much better, scoring ninety-three hits in one hundred and fifty-eight rounds. The best of the 6-inch guns made fourteen hits during seventeen rounds fired in two minutes, while the best group of seamen fired forty-six rounds and made thirty-three hits. The Jupiter's best 6-inch gun fired sixteen rounds in the time allowed and scored fourteen hits.—*United Service Gazete.*

The steamer Kashing, bound from Chefu to Shanghai, struck a floating mine at midnight on October 25, off the Shantung promontory, and had to put back to Wei-Hai-Wei. A large rent, measuring 10 feet by 12 feet, was torn in her port bow, and the deck above was blown up. One Chinaman of the crew was killed outright, another fell through the hole in the bow and was drowned, and three were injured.—*London Graphic.*

It is announced that the French battleship Patrie, now being built, is to be fitted with a new 18-inch torpedo with greater air pressure than usual for propulsion, whereby both the speed and range will be increased.

The battleship torpedoed with the Hatsuse last June was not the Yoshima but the Asahi, which, however, was very little injured. She was hit in the extreme bow, and patched up within a fortnight. The Yoshima was disabled elsewhere with mines. Altogether the Russians torpedoed two battleships, damaged one battleship and one cruiser with mines, and sank three inferior craft by the same means. To do this cost them six battleships and two cruisers destroyed, one battleship and two cruisers interned, and two small cruisers sunk.—*Engineer.*

Some interesting experiments with live torpedoes have been made in the Mediterranean. These showed that the old 14-inch pattern is of little use. As regards the 18-inch, this torpedo is effective up to 1000 yards; beyond that it is uncertain. For some time to come, however, it must remain in general use in our fleet, as the formidable 3000-yards weapon is hardly perfect enough yet for general issue.—*United Service Gazette.*

Much interest attaches to the trials of torpedoes from the under-water tubes of the King Edward VII. The tests were very severe; one screw was worked at full speed ahead while the other was at full speed astern with a view to determining the effect of the currents thus produced upon the accuracy of the torpedoes. It was observed with satisfaction that the action of the gyroscope was all that could be desired.—*Moniteur de la Flotte.*

A new torpedo-firing method has just been experimentally introduced into the Naval War Game. In substance it compels the firer to do just what he would have to do in war—estimate the speed and course of the enemy. If he guesses right he hits—if he guesses anything more than a knot or so, or a point or so out, he misses. The new method is complicated, but it is certainly better war training.

Training submerged tubes are to be fitted to new German warships. Apparently the new invention is one discarded in the British fleet fifteen years ago.—*Engineer.*

EFFECTS OF THE JAPANESE RIFLE (translated from the *Revue d'Artillerie*, November, 1904, by Captain D. B. Stewart, R. F. A.).—We believe the Japanese possess the smallest caliber rifle of those in actual use. When war was declared, it was doubted whether, in spite of the trajectory, the immediate effect of the bullet on man was sufficient to fell a man instantaneously, and prevent him taking further part in the action, before being put out of action by the results of the wound.

This question was the special study of Surgeon-General Kikuchi, on the Russian prisoners; and below is a free translation of his work.

"The Russian prisoners who arrived at Matsayama for our care afforded me a unique opportunity to form an exact idea of the qualities of our new rifle, 'Meiji' now employed for the first time.

"As far as the wounds are concerned, they appear generally of a benign type, which speaks well for the humane qualities of such a powerful projectile.

"I should here state that I was detailed by the Government to study the defects and qualities of the new rifle previous to its adoption. This was not altogether easy, as I could not take into reckoning the effects on living men. We substituted for our experiments the carcasses of animals, as well as live ones, and basing myself on these trials, I was able to strongly recommend this rifle to the Japanese Government as an advance on the old one; I specially stated that any shot, although it might not strike a vital spot, should put a man out of action, and that nevertheless the percentage of recoveries would be higher than formerly.

"Shortly after, the press of our country raised doubts on every hand, on the subject of the efficacy of our small-bore covered bullet, and when some foreign experts appeared in the theater of war and contradicted my advice, I was fearful for my advice. The results of the present war have only overwhelmingly confirmed my observations, for in addition to the enormous penetration of our bullet, it has been proved that the effect produced on an enemy is sufficient, even when the wounds are trifling, to put him out of action at once.

"On the other hand, we must consider the extraordinary speed with which recoveries are made, as a great step on the path of humanity. This is due to the fact that the bullet penetrates rapidly without producing great ravages, or fractures increased by splinters in the part touched. The greater part of the Russians who have fallen into our hands received their wounds in the actions of the Yalu; forty days have since elapsed, and the improvement has nearly everywhere been so rapid, even for those seriously wounded, that they may be considered almost cured, and a great number of them have been sent away as convalescent. Among them there were men very seriously wounded, *e. g.*, one of them had a perforated lung, and a loss of blood which I estimate from three-fourths to one liter. Now this man has been sent away to-day as cured. Another had a dangerous wound on the lower part of the stomach; a third had had the left arm, the lung, and the right arm penetrated; another had been struck by a bullet penetrating the upper part of both thighs, and many others had received analogous wounds.

"It is surprising that these men are not dead; on the contrary, as I

have already said, they are all either on the high road to recovery, or convalescent.

"If these Russian wounded had been struck by our old weapon the 'Mourata,' the cure would have been very long and doubtful. During the Chinese War (1894-95), in which the Mourata was alone used, this class of wound became putrid, and the patient was then lost. Now-a-days the diagnosis is nearly always favorable, for we have not to fear further complications, or at any rate in a very small proportion of cases.

"I might even state, that in spite of its rapid penetration, and the small extent of wounds, the effect is more rapid on the wounded, than with our old 'Mourata' (an exact copy of the Gras rifle). From my personal observation, and basing myself on my experience of the Chinese and present war, I might even state that the 'Mourata' with its slow penetration, did not clean cut the veins and nerves, which it met, but pushed them aside in dividing them like indiarubber pipes, leaving the veins intact. This does not occur with the Meiji bullet, which penetrates everything which resists it, and cuts clean through the veins, causing of course a great loss of blood, and putting the wounded man out of action. It was noticed that, among the Russian wounded, there were men with as many as seven wounds. This caused me to fear that in many cases the man was only put out of action after receiving several wounds; this fact would have put my adversaries in the right. I set myself to investigate the particulars of these cases, and personally asked the men when and how they were wounded. My enquiry resulted in establishing the fact, that in nearly every case the Russians had been knocked over by the first shot. With the extraordinary trajectory of our rifles, these unfortunate men who found themselves in front, and whom it was impossible to rescue or remove to ambulances, were constantly struck again as our troops approached the Russians; they declared that the Japanese bullets, so to speak, shaved the soil.

"Horrible as these successive wounds may appear, I may say I was pleased with this explanation, as it confirms my first statements.

"Some doubt still exists as to the effects of the Japanese artillery fire. This is due to the fact that the navy still maintains secrecy as to the projectiles employed at Chemulpo, etc. Some qualified gentlemen who saw the Russian wounded at Chemulpo are of opinion that the Japanese only used shrapnel, whilst here in Japan, it is generally believed that shells filled with a high explosive were employed, bursting into thousands of fragments like shrapnel. One fact is certain, that the Russians were quite overwhelmed with wounds, and that from some of them there were extracted over one hundred small splinters. The Japanese have assuredly a powerful explosive in their Shimosé powder; it is currently reported that it is exactly similar to that used in the German forces. For the Japanese, the principal (and from a military point of view, sufficient) point is that they have a superior powder, remarkable arms, and that these men know better how to use them than do the Russians.—*Royal Artillery Institution.*

AUTOMATIC RIFLES.—It is essential that every military weapon should possess the following characteristics:

1. *Strength.*—To withstand the wear and tear of service.
2. *Simplicity.*—So that it can be easily stripped to remedy faults, for inspection, and cleaning purposes.
3. *Accuracy.*—The rifle should be correctly sighted and the sights correctly centered, so as to give the true direction.
4. *Lightness.*—As light as possible consistent with strength and non-excessive recoil.
5. *Handiness.*—The rifle must come up to the shoulder well and be well balanced, so that the fore sight can be placed on the mark with ease and celerity.

6. *Good Ballistic Properties.*—The velocity should be high, both muzzle and remaining; the trajectory should be flat, and the bore should be of such a diameter that the bullet will have a favorable sectional density. No. 6, of course, is intimately connected with the bullet and powder charge.

It may be assumed that with a non-automatic rifle the greatest rapidity of fire has been achieved in the various mechanisms at present in use by the great powers. This may be taken at about 20 to 25 aimed shots a minute with a highly-trained expert shot. The only time lost, so to speak, is that required for recharging the magazine and bringing the rifle to the aiming position. The question that we propose to discuss now is the advantages and disadvantages that may be expected from an automatic rifle. In an automatic rifle the force of the recoil or portion of powder gas is used to perform the following motions mechanically: Open the breech, eject the empty case; cock the firing mechanism; close the breech, placing a fresh cartridge into the chamber; and fire the new cartridge or not at the will of the firer.

No automatic rifle is worthy of consideration for adoption as a military arm unless it possesses all the six qualifications already referred to, and also performs the five motions mentioned above with certainty. Moreover, it must be so arranged that, should the automatic action be disarranged and thrown out of action by damage or dirt, the rifle can still be used as an ordinary magazine rifle. These are the difficulties that have to be faced. Now the advantages of an automatic rifle are: A greatly increased rapidity of fire, as the rifle can be fired, if set for automatic fire, at a very high rate so long as cartridges are in the magazine; and if set for automatic feed, but non-automatic fire, as fast as the trigger can be pressed so long as cartridges are in the magazine. Let us now discuss these two advantages. A soldier armed with an automatic rifle capable of developing this very high rate of fire becomes to all intents and purposes a machine gun, combining as he does the power of pouring salvos of rapid fire (up to the capabilities of the magazine) without requiring the services of mules to carry the gun and carriage or a "section" of men to man the same. It is very evident that this one man would be harder to locate and to disable than the machine gun and its *personnel*. On the other hand, the capabilities of the magazine are limited, and when once it is emptied the soldier is powerless to inflict damage on the enemy until the magazine is replenished. This, of course, holds good in non-automatic rifles, but the quicker the rate of fire the more often will the powerlessness occur. The moral of this is that men must be taught to husband their ammunition, and not to fire unless they can more or less be certain of obtaining a tangible result; in other words, that although quickness of aim and accuracy in snap-shooting is essential, yet it by no means is to be deduced from this that an increased rate of fire is desirable. If this is granted, it may be reasonably asked, why put into the hands of the soldier this delicate and expensive weapon? The weight of the Maxim gun and its mounting may be taken at about 130 pounds, yet with this weight of metal and with the addition of clamps and scattering stops it is impossible to keep the aim in rapid fire even. After about 20 rounds, unless fire is directed on a large mass of troops or extensive area of ground, fire must be stopped and a fresh aim taken. No rifle to be carried by a foot soldier should weigh more than 9 pounds, and with this small weight it seems impossible that any accuracy can be expected with an automatic rifle (set for automatic fire) after the first round. The lighter the rifle, other things being equal, the greater the inaccuracy.

On the other hand, every sportsman when big-game shooting will know that so long as the quarry remains absolutely stationary, its location is extremely difficult. The trained gillie or shikari will, it is true, be able to spot the game when motionless, though quite indistinguishable to the ordinary eye; but this is due to training of a lifetime. It follows from this that anything which will tend to lessen the movement of a soldier

firing behind cover or in the open will save a great amount of casualties. Armed with an automatic rifle set for automatic feed, a soldier can be practically motionless whilst the ammunition in his magazine lasts, his sole motion being to press the trigger.

It would seem that the whole practical utility of so-called automatic rifles rests with transport and the facilities for feeding the firing line, once committed to the assault. As to the feasibility of feeding this line, opinions differ, but it would seem to directly hinge on the cover and accidents of the ground available. The firing line may be more or less safely ensconced behind individual cover, but between it and the supports lies a stretch of bullet-strewn ground, which must be passed over by anyone attempting to replenish the empty bandoliers of the advanced line. Accidents of the ground may, of course, furnish covered approaches, which will minimize the risk and enable the necessary advance to be made. It is open to doubt whether the possession of a rifle like the Lee-Enfield, capable of firing at the approximate rate of 20 rounds a minute, instead of one round in two minutes, like the Enfield, has emptied the soldiers' bandolier or pouch in a shorter time. Many assert that the difficulty now is to get men to expose themselves so as to open fire; others hold that the men evince a great desire to empty their magazines and bandoliers and then lie passive behind cover. Whichever theory is correct, it would seem that the introduction of an automatic rifle for general use would be a doubtful advantage; for if the combatants prefer to remain inactive behind cover, no gain is obtained by giving them an automatic rifle. If, on the other hand, the object of the attacker is to get rid of his ammunition as soon as possible, so that he can remain in safety behind his cover, the possession of a rifle with great celerity of fire appears also to be a doubtful advantage. A modern battle, lasting perhaps for days and nights, will necessitate very careful husbanding of the ammunition by day, as it is most likely only by night that the bandoliers of the most advanced troops will be able to be replenished.

The great disadvantage of the machine gun in the attack is its large *personnel* and the transport required for the carriage of the gun, ammunition, and carriage, rendering the gun and its detachment a conspicuous object; but an automatic machine rifle carried by one man on a pony, with another man on another pony as "horseholder" and carrying a reserve of ammunition, would be most useful. Each company of a battalion, each squadron of a cavalry regiment, each company of mounted infantry might have some of these guns added to their establishment, the gun to weigh about 18 pounds. The great utility of these guns would be the protection of flanks, the covering of bridges or fords, across which either the defenders, if in retreat, or attackers must pass, and the defence of angles in squares or zarebas. They would be invaluable in deceiving the enemy as to the number of rifles actually opposed to him, as with their great mobility and rapidity of fire they would be very hard to distinguish from a considerable force widely extended.

Automatic rifles are worked by two methods. The generally adopted method is that the barrel is allowed to recoil a certain distance, and by acting on a lever forces back the bolt after the bullet has left the muzzle, causing the bolt to rotate, thus extracting the cartridge case. The bolt in its backward motion compresses two springs, the "recoil" spring and the "mainspring" or percussion spring. When the bolt has been drawn back to its fullest extent a cartridge is fed up into the bolt way by the magazine spring. The bolt then is forced home by the extension of the recoil spring, carrying the barrel home. The bolt is rotated by a stud working in a cam groove, thus sealing the chamber and causing the locking lugs to enter their grooves. The "mainspring" or "percussion spring" remains compressed, being held back by the sears. There are generally two sears and two bents. One sear and one bent is acted on by the recoiling portion, and is knocked out of action when the bolt goes home;

this leaves the mainspring or percussion spring compressed by the trigger sear. On pressing the trigger the sear is released, and the striker flying forward ignites the cap. This is the method employed with "automatic feed" but "hand-firing." If it is desired to employ "automatic fire," the continuous pressure of the finger on the trigger will throw the trigger sear out of action, and the rifle will be fired by the "recoil sear." Should the recoiling action break down, a component is generally attached for throwing the recoiling action out of gear, and the bolt can then be worked by hand in the ordinary way. The advantages claimed for recoil-operated rifles are that by employing a certain portion of the recoil to compress springs and overcome the friction of the recoiling parts, the actual recoil to be borne by the firer is considerably lessened, and consequently the "kick" and its consequent strain is reduced. Further, long connecting rods and exterior appendanges to the rifle are avoided; consequently the mechanism can be made more compact, and repairs and cleaning can be more easily carried out, as all parts of the rifle and action are more or less easily stripped and "getatable." Their disadvantages at present are that they are not perfect in their action, since the cartridge-cases in some cases are thrown out into the face of the firer, and the rifle when set for trigger or hand-fire fires automatically and *vice versa*. Again, with the present small-bore rifles, the force of recoil is somewhat inadequate to impart sufficient momentum to the recoiling position to perform the duties allotted to it, and also overcome extra resistance caused by fouling, dirt, or rust on the recoiling portions. Again, as the barrel is in motion during the passage of the bullet down the bore, the ballistic qualities of the bullet may be impaired, owing to interference with the normal jump and flip of the barrel.

In gas-operated rifles a minute hole is bored in the barrel of the rifle between the chamber and the muzzle; a certain portion of the gas from the explosive passes through this hole, forcing back an armature and compressing a strong spring. This armature drives back a long piston or connecting-rod, which is connected to the bolt by means of a stud working in a cam, causing the bolt to be rotated and driven backwards, ejecting the case and compressing the mainspring. Cartridges are fed up from the magazine. As the rod is forced back, it compresses the "recoil spring," which, on the bolt reaching its farthest limit, forces it forward, again placing a cartridge in the chamber, and, by rotating the bolt, engages the locking lugs in their grooves. By a system of sears and bents the rifle can be fired either automatically or by hand. The advantages of gas-operated rifles are that the force can be regulated by the size of the hole cut in the barrel, so as to obtain a large margin of reserve force to overcome any increased resistance; also by the adjustment of a screw-plug in the cylinder the amount of gas actually allowed to escape from the hole can be regulated. As the barrel is fixed, the ballistics are not altered by the automatic action. The disadvantages of gas-operated rifles are that, however tight and well-fitting the joints and bearings of the piston and cylinder may be, some gas is sure to escape, owing to the very great pressure it exerts on those parts. This gas causes erosion. As it is necessary to strip the rifle to get at the piston and cylinder, they are difficult to clean. In the present state of manufacture they also share with recoil-operated rifles the fault of uncertainty of action. Whatever disadvantages automatic rifles may possess, either inherent in themselves or else appertaining to their tactical utility, there cannot be any doubt that their adoption is only a matter of time. With increased experience and improvements in manufacture, an automatic rifle, certain in its action, portable, compact, and easily cleaned, will be patented by some inventor, adopted by some nation, with the usual result that other powers will follow suit.—*Army and Navy Gazette.*

THE RUSSO-JAPANESE WAR.

NAVAL LOSSES OF THE WAR.—The following comparative statement of naval losses during the Russo-Japanese War to date may not be without interest:

	RUSSIA.
BATTLESHIPS.	
1. Tsarevitch	Interned at Kiauchau.
2. Retvisan	Sunk by shell-fire at Port Arthur.
3. Pobieda	Sunk by shell-fire at Port Arthur.
4. Peresviet	Sunk by shell-fire at Port Arthur.
5. Poltava	Sunk by shell-fire at Port Arthur.
6. Sevastopol	Fate uncertain.
7. Petropavlovsk	Blown up by mines off Port Arthur.
ARMORED CRUISERS.	
1. Rurik	Sunk in Straits of Tsushima by Kamimura.
2. Bayan	Sunk by shell-fire at Port Arthur.
PROTECTED CRUISERS.	
1. Variag	Sunk at Chemulpo.
2. Pallada	Sunk by shell-fire at Port Arthur.
3. Diana	Interned at Saigon.
4. Askold	Interned at Shanghai.
5. Boyarin	Blown up by mines at Dalny.
6. Novik	Driven ashore at Korsakov.
7. Yenesei	Blown up by mines at Dalny.
8. Amur	Sunk by shell-fire at Port Arthur.
GUNBOATS.	
1. Gremiastchy	Sunk by shell-fire at Port Arthur.
2. Otvajny	Blown up by mines off Port Arthur.
3. Mandjour	Interned at Shanghai.
4. Koreitz	Sunk at Chemulpo.
5. Gilyak	Sunk by shell-fire at Port Arthur.
6. Bobr	Blown up by mines at Dalny.
7. Sivoutch	Destroyed at Newchwang.
	JAPAN.
BATTLESHIP.	
1. Hatsuse	Blown up by mines off Port Arthur.
COAST-DEFENCE SHIP.	
1. Heiyen	Blown up by mines at Dalny.
PROTECTED CRUISERS.	
1. Yoshino	Accidentally rammed by Kasuga.
2. Sai-yen	Blown up by mines off Port Arthur.
3. Miyako	Blown up by mines at Dalny.
GUNBOAT.	
1. Kaimon	Blown up by mines at Dalny.

In addition to these, the Russians have lost eighteen destroyers and three torpedo-boats; the Japanese, torpedo-boat No. 48, and, it is said, three destroyers. Of the Russians, the Grosovoi is disarmed at Shanghai; the Bezpchchadni, Bezshumni, and Bezstrashni are interned at Kiauchau. The Burni was beached near Wei-hai-wei, the Reshitelni escaped to Chifu, and has since been added to the Japanese fleet, and the Vnimatelni and Lieutenant Burakov were cornered and sunk in Pigeon Bay.

There have been persistent rumors that the first-class battleship Yashima was also, like the Hatsuse, sunk in June by striking a mine near Dalny. It should be noted that Togo makes no mention of her as a complete loss,

and all that can be said is that the Japanese authorities have never denied or confirmed the rumor. A telegram, however, published in Rome on the 8th inst., from Tokyo, sent by the Italian agency, throws some light on the matter, for it states that the battleship Yashima, which was sunk by a mine, had at last been successfully raised and brought safely into dock, where her repairs were being energetically proceeded with. This would look as if she had been badly damaged by a mine, but had fortunately only sunk in shallow water or had been beached; and that so long as there was a chance of salving her, the Japanese preserved perfect silence on the matter. The fact that, as is clear now, in the battle of August 10, the Russians had six battleships to the Japanese four, shows the bad handling of the Russian ships in a worse light than ever.—*United Service Gazette* and *United Service Institution.*

We find in the *Marine Rundschau* a very interesting account of the sortie of the Russian fleet from Port Arthur on August 10, from a description of an officer of the Tsarevitch. There is a good deal of information in it, and the details of injuries inflicted on the flagship are interesting and suggestive. One 12-inch shell struck the conning-tower on the starboard side, and, taking a deflected course, issued obliquely at the other side. The navigating officer and several others were killed and the compass broken. Another 12-inch sheli struck the foot of the foremast between the upper and lower bridges, endangering its safety, and killing Admiral Withoeft and about fifteen men, while Admiral Matusevitch, chief of the staff, and Captain Ivanoff were wounded. Another shell, probably a 12-inch, entered below the water-line under the forward 6-inch turret, admitting water into the space between the outer sheathing of the hull and the continuation of the armored deck, which there took a vertical direction, constituting a bulkhead. The *Rundschau* has some comments upon the defective handling of the Russian fleet and its tactical failure. No Russian torpedo-boat has so far fired a torpedo, the boats having been used for mining and observation purposes. The Japanese also are not thought to have made the best use of their torpedo-boats, and there was failure on the part of the fleet in not cutting off the ships from Port Arthur. The *Rundschau* proceeds to argue against the exponents of the "Jeune École" who are endeavoring to twist the lessons of the war to support their own theories. The writer of the article would like to know how Russian ships could have been blockaded at Port Arthur if the Japanese had not had battleships outside, and what would have been the case of Japanese transports if the Russians could have left the port. "The command of the sea belongs, in spite of mines, torpedoes, and submarines, to the powerful battleship possessing sufficient speed."—*Army and Navy Gazette.*

Experiments were carried out off Yarmouth, on Tuesday evening, to determine whether a fishing trawler would look like a torpedo-boat under a searchlight. The gunboat Hebe turned her searchlights upon a trawler in motion, and simultaneously a photograph was taken, which will be submitted to the International Commission of Inquiry.—*United Service Gazette.*

NAVAL LESSONS.—In regard to purely naval lessons, the war has been somewhat barren up to the present time, though doubtless we shall learn more when the history is written and material is pieced together by the competent naval critics who have followed events, more or less, on the spot. It has been held that the inefficiency of the locomotive torpedo has been proved; but, if so, almost the same thing might be said of the naval gun afloat, for the destruction of the Russian ships from the land positions at Port Arthur cannot be considered a naval feat. At any rate, the torpedo first opened the ball by putting out of action two Russian battleships; and

though the circumstances were undoubtedly exceptional, it is always wise to make allowances for the chances of war. It was, however, in the menace of the torpedo that its chief effectiveness was found. Admiral Togo had to keep his ships at a distance, finding refuge at a distance from the port he was blockading, and doubtless it was the enemy's torpedo craft he had chiefly in mind, for nothing would have suited him better than for the big Russian ships to have come out to try conclusions.

A result that was unexpected, however, was the small damage done when the torpedoes did get home, compared to what had been anticipated. It has been generally held that a square blow from a torpedo was hardly to be received without mortal damage, but the vessels struck on the night of February 8 were both repaired, and came again into the line of battle. That they were in smooth water and close to port must be borne in mind; but, again, the facilities for carrying out extensive repairs were of a very imperfect nature at Port Arthur, if reports are to be credited. We shall, however, know more about this when the war is over, and fuller details are at command.

If, however, the locomotive torpedo has often failed to score, as is undoubtedly the case, its more inert brother the mine has proved a potent means of destruction. The mechanical mine is, however, as apt to be as dangerous to friend as to foe, and may be equally as destructive to neutral shipping. Whether the powers will, on the latter account, rule it as inadmissible, and pronounce it an act of hostility against all nations to set mines afloat, remains to be seen. Had such an ordinance been in force, and observed, the Japanese would not have lost their great battleship the Hatsuse, and the Russians the battleship Petropavlovsk. The Japanese battleship Yashima was also reported to have been sunk, but this appears to have been an error. At any rate, mines have destroyed of the Russian fleet, besides the Petropavlovsk, one cruiser, a mine vessel, the unfortunate Yenesei, three gunboats, and some torpedo-boats or destroyers; whilst the battleships Pobieda and Sevastopol, and the armored cruiser Bayan, were seriously injured. The Japanese lost by mines the Hatsuse, already mentioned, a gunboat, and a torpedo-boat.

The failure of the gun to do more damage was owing to the fact that the operations were carried on at long range, which gave an advantage to armor. If we are to accept the fighting that took place as characteristic of what may be expected in future, the inefficiency of a secondary armament of smaller nature, such as the 6-inch guns, must be recognized. Unfortunately, they form no inconsiderable part of the equipment of a large number of our ships. This, however, is a subject recently dealt with in our pages. Even the projectiles from weapons of larger caliber failed to inflict the terrible injuries that all anticipated. The Tsarevitch was often struck—it is said fifteen times by 8-inch and 12-inch shells—and yet she escaped, to ultimately find safety in the German port of Kiachau, where she was disarmed. Until more details of the firing are known it would, however, be idle to draw conclusions from these facts; but armor here appears to have beaten the gun.—*Engineering.*

ADMIRAL TOGO'S DESPATCH.—With the fall of Port Arthur and the complete destruction of the ships in the harbor, the Russian flag disappears, for the time being, from the waters of the Far East. It will be interesting to place on record Admiral Togo's historic but modest despatch to his Government on the 22d of last month, in which he announces the close of the naval operations before the beleaguered port:

"Since 203-Meter Hill was occupied," writes the Admiral, "by the gallant and desperate attack of the besieging army, the bombardment of the enemy's squadron by siege and naval guns has become effective. In consequence, the Poltava and Retvisan were sunk, and subsequently the Pobieda, Peresviet, Pallada, and Bayan were also sunk. The Sevastopol escaped the land bombardment, and left the harbor on the 9th inst., and

anchored near Chen-Fao-Shan. She was attacked there continuously by our torpedo-boats and heavily damaged.

"The main strength of the enemy is completely crushed. Only the weak gunboat Otvazhny and several destroyers remain afloat. In the circumstances our combined fleet has removed the unnecessary parts of the blockade, which has been maintained since the 1st of May, and has arranged a closer watch for ships attempting to run the blockade, and a look-out for the remnant of the enemy's squadron.

"During the blockade we suffered from the enemy's mines, both laid and floating, from high seas, and from dense fogs. The Miyako, Yoshino, Hatsuse, Kaimon, Heiyen, and Saiyen were sunk, and many gallant and loyal officers and men were killed; but we succeeded in maintaining the blockade. When the enemy emerged from the harbor our fleet successfully engaged their ships, and finally, by the valuable support of the besieging army, succeeded in crushing nearly all the enemy's squadron.

"Our second squadron so heavily damaged the Vladivostok squadron that it has since been unable to leave port.

"All this success is gratefully attributed to the brilliant virtue of our Emperor."—*United Service Institution.*

INJURIES TO THE TSAREVITCH.—The following description of the injuries sustained by the Russian battleship Tsarevitch in the action of August 10 last, which has been lying ever since in the German harbor of Tsingtau, is taken from the *Marine Rundschau.* According to the reports of the Russian officers, the ship was struck by fifteen 12-inch and a greater number of shell of small caliber:

Shot No. 1.—A 12-inch shell forward on the starboard side at the level of the upper deck, striking the hog's-back of the bow anchor. The projectile tore a hole in the ship's side 2 x 2 meters, passed through the bow and sheet anchor chains, but hardly left a trace of its passage in the hold. Both anchors were lost.

Shot No. 2.—A 12-inch shell on the starboard side, level with the upper deck, and just under the forward 12-inch turret. The shell tore a hole in the ship's side 1 x 1 meter, but did practically no damage in the interior.

Shot No. 3.—A 12-inch shell that struck the armor of the forward 12-inch turret. Ineffective.

Shot No. 4.—A 12-inch shell squarely striking the starboard side of the forward conning-tower. Of the persons in the conning-tower, the ship's navigator, a sub-lieutenant, the helmsman, and two or three orderlies were killed, their heads being blown off, while two officers were stunned. Through the falling bodies, the wheel was turned hard to port, the steering-gear being uninjured; the compass was destroyed. The cables running along under the roof of the conning-tower were torn away, and the mechanical connection with the engines destroyed. The head of the shell passed out of the tower and buried itself in the hammock boxes that form the forward bridge rail, and here it was later found.

Shot No. 5.—A 12-inch shell that squarely struck the foot of the foremast between the upper and lower bridges. The projectile pierced the starboard side of the mast and burst against the port side. Toward the bow the iron plates of the mast were entirely torn way. At the back only does a connection between the two bridges remain, but this is not strong enough to bear the weight of the heavy fighting mast. The latter actually rests on the upper bridge only, being joined to this by strong angle irons that were uninjured. The search-light cables in the mast were broken. The shot killed Admiral Witthöft, the fleet navigator, and some fifteen men. The chief of staff, Admiral Matusewitch, and the commander, Captain Ivanoff, were wounded. The officers were probably in the fire lee of the tower.

Shot No. 6.—A 12-inch shell struck the lower part of the forward funnel squarely. The shell penetrated the starboard side and exploded against the port side, which was torn to pieces.

Shots No. 7 and 8.—Two 12-inch shells injured the upper and lower parts of the rear funnel. They struck and burst against the starboard side of the smoke-stack, which was ripped up and torn from top to bottom. The port side shows no injury that can be traced to either of these shots.

Shot No. 9.—Probably an 8-inch projectile fired from a cruiser. The shell penetrated the port side wall of the superstructure below the launch. Several injuries resulted, among them the destruction of the bakery. The shell made a round hole about 1 meter in diameter.

Shot No. 10.—Another 8-inch shell, that penetrated the port side of the forward lower edge of the rear 6-inch turret, leaving a hole 1 x 0.55 meter in the wall. The covering of the lower turret structure in the admiral's mess was torn away.

Shot No. 11.—A 12-inch shell struck the top of the after 12-inch turret near the sighting-board and burst. The top was slightly dented, and some of the rivets of the angles joining the turret and the hood were driven in, killing a man inside of the turret. The man in the sighting-hood was rendered unconscious for a short time only. Pieces from the bursting shell penetrated the after chart room.

Shot No. 12.—A 12-inch shell burst and destroyed the forward chart room abaft the foremast.

Shot No. 13.—A 12-inch shell struck the after 12-inch turret on the port side. The shell probably burst at impact and did no damage.

Shot No. 14.—Probably a 12-inch shell that struck some 2¼ meters below the water-line, under the forward 6-inch turret and under the armor belt. According to the reports of divers, the projectile struck the joint of two of the outer skin plates. The plates, frames, and supports are said to be dented and bent, but not torn, for a longitudinal distance of about 3½ meters. The covering-strap is supposed to have jarred off, and about 150 tons of water allowed to enter the compartment behind the downward curved armor deck, through the rivet holes. The Tsarevitch entered the harbor with a barely perceptible list to starboard.

Shot No. 15.—A 12-inch shell passed through the port after-deck railing and the upper deck and burst. The bollard was half torn away. The teakwood covering of the upper deck is ripped up for about 4 square meters. The wood did not burn, and the deck planking splintered little.

The following facts may be noted in respect to these injuries:

1. As but part of the Japanese shells pierced the sidewall or did barely perceptible damage in the interior of the vessel, we may conclude that they burst too soon. However, in this respect the shots that struck the foremast and the funnel differ very widely from most of those that struck the hull. Much may be considered due to the difference in the effect of the description of shells used. It will probably not be far from the truth to finally conclude that the Japanese used some "half-armor shells with base fuses."

2. In spite of the wooden deck and of the fact that all boats were on board, the splintering effect was small.

3. The wooden decks did not catch fire as was the case in the Chino-Japanese War.

4. In no place was the armor pierced; all the vital parts lying underneath the upper armored deck were absolutely uninjured. Some pieces of the burst shell fell through the after funnel upon the boilers under it, and damaged a few superheater pipes. The explanation of the ineffectiveness of the heaviest Japanese shells against the Russian armor may be found in the tremendously long range and the apparent non-use of armor-piercing projectiles.

5. The hit below the starboard water-line under the forward 6-inch turret did not perforate the outer skin. The entrance of the water was due to the loosening of the rivets incident to the denting of the outer plates.

6. Both the fore and aft 12-inch turrets were struck without injury to

the revolving mechanism of the turret or the ammunition-serving apparatus of the guns. However, according to the statement of a German officer who visited the Tsarevitch, the forward turret shows a large groove on the starboard side.

There is no reliable information at hand concerning the quantity of ammunition used by the Russians. According to one of the officers, the lack of 12-inch shells—it appears 74 to 76 were fired from the forward turret and 40 to 45 from the rear turret—was one of the reasons for putting into Tsingtau.—*United Service Institution.*

TURBINE ATLANTIC LINERS.

There was launched on the 22d inst. from the stocks of Alex. Stephen & Son, Linthouse, Glasgow, the new Allan Liner Virginian, of 11,200 tons, which that firm was commissioned to construct at the latter end of last year, shortly after the order for a similar vessel was placed with Workman, Clark & Co., Belfast. The latter vessel, the Victorian, was sent off the stocks on August 25 last, and is at present fitting out for sea. Both these vessels, as is well known, are to be propelled by Parsons' steam turbines, instead of the ordinary reciprocating engines, and as they will be the first turbine liners to engage in the Transatlantic service, and will thus mark a highly important advance in the application of the steam turbine to ship propulsion, great interest is centered in their progress towards completion. When that is accomplished the vessels will be placed on the Canadian mail and passenger service from Liverpool; the Victorian sailing on her maiden voyage to Halifax, Nova Scotia, and St. John, N. B., on March 23, and the Virginian for the same ports on April 6.

Although the Atlantic has already been navigated by several turbine steamers—*e. g.*, the Turbinia, built on the Tyne, now engaged in lake service, and the yacht Emerald, built by the Linthouse firm, and absolutely the first turbine steamer to cross—the fact of the Virginian being one of the two pioneer regular turbine liners, and also of the vessel being the heaviest yet sent off the stocks at Linthouse, made the launch one of exceptional interest even on the Clyde, where large mail and passenger vessels being consigned to the water forms no great novelty. A large concourse of spectators watched the event, which was entirely successful, the naming ceremony being performed by Miss Eleanor Allan, Glasgow.

The Virginian's dimensions are 540 feet length over all, 60 feet beam, and 41 feet depth. She has been constructed under the supervision of Messrs. Allan's representatives, Mr. A. M. Gordon and Mr. David Johnstone, to the highest class in the British Corporation Registry, and to the passenger requirements of both the British Board of Trade and the American laws. She has accommodation for about 1650 passengers—470 first-class, 240 second-class, and 940 third-class. The vessel has a poop, long bridge, and forecastle, with large houses in the wells between the hatches, the tops of the poop and houses being arranged as promenades for passengers and sheltered by boat decks, which again form promenades sheltered by awnings. On the bridge deck is a long deck-house containing first-class state-rooms, with a wide alleyway on each side; above is the promenade deck, with deck-houses containing the first-class music and other saloons, sheltered by the boat deck above, which is itself a wide promenade, having the officers' quarters and navigation bridge at the fore end, and on each side a range of boats the full length of the deck. The vessel is specially designed for the conveyance of the Canadian mails and passengers, no fewer than five decks being fitted up for the accommodation of the latter, and that accommodation, it is almost needless to say, is conceived, and will be carried out, on lines which will afford every comfort and luxury that modern skill and forethought can provide. The Virginian has also good cargo space fore and aft, and is

divided by bulkheads into eleven holds, and with the subdivision of her water-tight double bottom she has twenty water-tight compartments. Her hull has been specially strengthened above the requirements of the British Corporation in order to make her doubly secure against the heavy weather of the North Atlantic. Every provision has been made for minimizing the discomforts sometimes experienced in this connection, and the cabin accommodation is heated throughout by steam, the pipes being so arranged that each individual passenger can modify the heat to suit himself. The emigrants are kept comfortable by an installation of the thermo-tank system, which combines the duties of heating and ventilation. Electric light is fitted throughout, and there is also an installation of the Marconi telegraph.

The feature of outstanding interest, of course, about the Virginian, as of her sister ship, is the turbine machinery. In the case of the Virginian the turbines are being supplied by the Parsons Marine Steam Turbine Company, Wallsend-on-Tyne, while the boilers—nine single-ended, and worked under forced draft—together with a very complete installation of auxiliary machinery, are being supplied from the engine works of the builders—Alex. Stephen & Sons, Limited—themselves. The propulsive power is to be transmitted through three lines of shafting, triple-screw propulsion of itself being a step almost novel in Transatlantic service, each fitted with one propeller of dimensions which, of course, strike us as puny for their duty as compared with the propellers of ordinary singe and twin-screw ocean liners. The revolutions are, however, abnormal from this point of view, being estimated at 270 and 300 per minute when the vessel is going full speed, which in ordinary service is to be 17 knots, meaning about 18 or 19 knots under trial-trip conditions.

The central line of shafting, arranged as in a single-screw vessel, is worked by a high-pressure turbine, the others, which are arranged as in twin-screw ship, by low-pressure turbines. The two latter have each a reversing arrangement, which enables them to be at once driven astern, either together or independently. The ship will thus be as easily and effectively maneuvered as regards backing or turning as an ordinary twin-screw vessel.

Regarding this reversing and maneuvering power, it is not the case, as has been reported, that the Parsons Company has devised a special arrangement for these liners. The arrangement followed is the same as that adopted with success in the turbine-propelled Channel steamers. The astern turbines are placed in the exhaust casing of each of the low-pressure turbines, and, when maneuvering, steam is admitted into the low-pressure turbines or the astern turbines, for going ahead or astern as may be required, independently of each other and the high-pressure turbine. A noticeable feature in the power of the astern turbines for quickly stopping a vessel was seen when the turbine steamer The Queen was stopped in two and a half times her own length when going at a speed of 19 knots.

Speaking of the importance of great stopping and reversing power for maneuvering purposes in ocean liners of high speed, at the luncheon which followed the launch of the Virginian, Mr. Nathaniel Dunlop, managing director of the Allan Line, said that Mr. Parsons had examined the problem and satisfied both himself and the owners and builders that it could be solved. They had no hesitation in accepting his assurance, and nothing had occurred in the process of construction to disturb their confidence in the system. He made this statement because a paragraph appeared some time ago in the American press, and was reproduced in our own, to the effect that the turbines had not answered the expectations of the Allan Line, and had not come up to the contract power. That statement was actually issued before the turbines were made, and before any trials of their power were possible. The turbine system promised many advantages to travellers by sea, its noiseless and uniform motion imparting a corresponding measure of steadiness to the ship in heavy weather. The speed, too,

of these turbine vessels on the Atlantic would reduce the time at sea, and, together with the shorter mileage of the Canadian route and its land-sheltered navigation on the Canadian side, should make it a favorable line to travel by to and from the American continent.—*Engineer.*

MISCELLANEOUS.

On the recent voyage between Vigo and Lagos the combined Atlantic and Channel fleets had some important maneuvers under Admiral Sir A. K. Wilson, V. C. The ships were divided into two fleets, B and X. B fleet consisted of a fast squadron, including the Triumph and five vessels of the Duncan class, and a reinforcement which included the armored cruisers Bedford and Good Hope, the cruiser Topaze, and four battleships of the Royal Sovereign class. The X fleet consisted of seven battleships of the Majestic type, with the cruiser Doris. The maneuvers were conducted on the following plan: X fleet was supposed to be making for a fortified port ninety miles away. B fleet, sighting the X fleet, six miles off, had to bring X into action before X could reach the port. The operations were brief but instructive, and B fleet was successful. Three hours after "war" was declared B's fast division got within range of the X ships, and soon after this placed themselves between X and the supposed port. During the maneuvers the cruisers fired several torpedoes, but only one hit was scored. This was an especially good one, however, the Good Hope getting her torpedo under the fore bridge of the Victorious while both vessels were steaming at full speed. The chief honors of the maneuvers rested with the engine-room staffs, who got some excellent work out of their respective vessels. The Triumph was much the fastest vessel in the whole combined fleet. Of the Duncan class the Duncan and Albemarle were the swiftest.—*United Service Gazette.*

TRAFFIC OF THE SUEZ CANAL.—A return of traffic for 1904 on the Suez Canal has just been issued. Great Britain heads the list with 1693 merchantmen, 5,516,400 tons, besides 34 or 92,184 tons in ballast; mail steamers 131, tonnage 585,560; warships 26, tonnage 44,189; transports 15, tonnage 71,959; a total of 1899 ships and 6,310,295 tons. Germany comes next with merchantmen 279, tonnage 955,839; in ballast none; mail steamers 112, tonnage 453,812; warships none, transports 6, tonnage 39,131; total 397, tonnage 1,448,782. France is third, with merchantmen 99, tonnage 332,309; in ballast 1, tonnage 272; mail steamers 85, tonnage 257,274; warships 10, tonnage 11,177; total 195, tonnage 601,032. The Netherlands come fourth, with merchantmen 83, tonnage 221,782; in ballast 4, tonnage 11,582; mail steamers 78, tonnage 203,309; warships 2, tonnage 1663; total 167, tonnage 438,336. The United States shows only war vessels, 15 in number, of a total tonnage of 21,464; and the other countries combined for the three months given in the canal bulletin dated December 12, furnish a list of merchantmen 2329, tonnage 7,397,267; in ballast 46, tonnage 110,619; mail steamers 542, tonnage 1,934,336; warships 101, tonnage 130,955; transports 21, tonnage 111,090; a grand total of 3039, tonnage 9,684,267.—*Nautical Gazette.*

The Metcalfe system of coaling at sea was subjected to a further test on the 10th inst., when the trial was carried out in the Channel. A very considerable swell was running, which caused the Basilisk to dip her hawse pipes in the water, and left her fore port clear, whilst rolling 15 degrees to one side and 5 degrees to the other. The speed of the vessels during the experiment was 10 knots, and 100 tons of coal were transferred to the Revenge in 2 hours 16 minutes, when the trial was discontinued owing to one of the 4½-inch hawsers carrying away. During the period of transhipping the coal the ships were continually turning, in order to take

the sea in every direction, and so obtain a full test. The bags only dipped into the water twice, and none of the gear of the apparatus was carried away except two clips.—*United Service Gazette.*

A remarkable performance with a submarine has been accomplished by a few lieutenants and sub-lieutenants of the Thames. They crossed from Spithead to Cowes and back under the water, and did the distance of about 12 knots each way in excellent time. To have navigated a vessel of this type safely across the Solent, with its currents and peculiar set of the tides and its sand-banks, is regarded as extraordinary in modern naval practice, and that it should have been performed by these young officers makes the event additionally interesting. There is evinced on the part of officers and men of His Majesty's navy a marked desire to serve on these vessels, and the volunteers for that purpose are far in excess of requirements.—*United Service Gazette.*

PROGRESS OF WAR MATERIAL IN 1904.—We remarked in these columns, three years ago, that "the development and progress of war material during 1901 had been more noticeable as regards the land service" than in that appertaining to the British navy. Such can certainly not be said as regards the year 1904. Three years ago, when the campaign in South Africa was drawing to a conclusion, it had been abundantly demonstrated that the field artillery of our army was furnished with a weapon which was inferior in many respects to that with which the roughly-equipped Boer batteries did so much execution in the early days of the expedition. This fact being recognized, not only had a large number of genuinely quick-firing 15-pounder field guns been obtained by purchase, which were reported on very favorably after experimental practice with them at Okehampton, but a great quantity of 4.7-inch siege guns, together with a full equipment of 5-inch and 6-inch howitzers, to act as guns of position in field works, with heavy field batteries, were put in hand, and in course of manufacture by the trade and at Woolwich Arsenal. At the same time, so large were the orders given for ammunition and projectiles of all classes, that the magazine accommodation had to be more than doubled to provide for the increased number of rounds which were to be retained in store. But the output of energy displayed during 1901 has been very insufficiently maintained. In the three years that have passed by, ample time has been afforded to rearm our field artillery. Nevertheless, with the exception of the twelve batteries which have been furnished with the German quick-firing 15-pounder, the whole of our field and horse artillery batteries are at this moment provided with weapons which are inferior in handiness, range, rapidity of fire, and accuracy to those of most of the European powers and Japan. This is utterly incomprehensible. Sufficient money has certainly been voted by Parliament during this period, for expenditure has gone up by leaps and bounds; but, so far as regards field and horse artillery guns, we are almost as badly off as when war was declared in 1899. It is true that orders have been given out within the past four weeks for 107 batteries of field guns—17 batteries for the horse artillery and 90 for the field artillery—642 guns in all, being at the rate of six guns per battery, or going back to the old scale of equipment again, a most salutary arrangement. But these are all to be paid for by a special vote of two and a half millions sterling, and the question as to where all the extra millions voted for 1902, 1903, and 1904, have gone still remains unanswered.

It is also quite true that a certain number of coast batteries have been partially rearmed, and the work that has been accomplished in this direction during the past year and a half noticeably has furnished a substantial increment to the permanent defences of the United Kingdom and of our coaling stations, as well as towards the strength of Hongkong, New Zealand, Bombay, etc. But expenditure upon the last two places is met

locally, so our armament estimates are recouped as regards these items, and, indeed, many others of similar character. The naval works vote has also made expenditure which was virtually for land purposes appear against naval funds. How, then, have all the extra millions been expended?

Let us, however, dwell for a moment upon what has been done, rather than upon what has been left undone. Unquestionably the efficiency of our siege train and batteries of position has been raised to a high standard. The new guns and carriages, or mountings, are of the most powerful and trustworthy type; and a remarkable contrast to the siege equipment of the German army, the smallest 12-centimeter howitzer of which requires six horses to drag the gun and limber, the ammunition wagon being still more cumbrous. Moreover, the 10-pounder jointed screw mountain gun, which has just been issued for hill service, has proved a very useful weapon in Thibet, and will doubtless be increased in caliber for future hill warfare. The latest 6-inch Mark III quick-firing gun of 7 tons, which occupies the position of the antiquated 7-inch and 9-inch muzzle-loaders, in all of the lately rearmed coast batteries, has an initial velocity of 2154 foot-seconds, and an extreme range of 10,900 yards. The latest 9.2-inch, Mark X, gun, which is practically a quick-firer, is of 46.66 calibers in length, and has a muzzle velocity of 2800 foot-seconds. Its perforation of Krupp steel at 3000 yards is 10 inches, with an uncapped projectile. The cap would increase the perforation about 25 per cent. Most of the 9.2-inch guns have been mounted this year.

Perhaps in subsidiary elements of war material the greatest progress has been made on shore during 1904. The system of position-finding by night has been brought to a very high degree of perfection by means of an improved arrangement for search-light details. The large and important positions in our coast fortresses, which have several groups of guns, each worked by their own position-finder, are now fitted with three separate search-lights. One of these has a fixed beam, stretching across the estuary or roadstead, through which an enemy must pass in approaching the fortress, thus indicating the exact locality of the hostile vessel for a moment, which is at once covered by a second, or fighting light, and then kept in the beam as it approaches the defending batteries; the third light is for prospecting outside of the fixed beam, and for giving notice of the approach of the enemy, whilst still at a considerable distance. The movable search-lights are so arranged, with a see-saw apparatus guiding the sweep of the beam in front, that, as they revolve, they clear the site of friendly works, and do not expose them to the observation of the foe. Whilst this illumination of the hostile vessels is in progress, the control of the position-finders keeps the guns of the various batteries ever laid upon them; and actually, in some cases—where automatic hydraulic gear is employed to elevate and train—following the path of the ships as they approach. It is needless to say that night attacks are those which require the most skilful forms of defence. In the daytime, a trial shot or two will be of as much service very often as a position-finder. Singularly enough, the exact site of a search-light in the darkness is very difficult to spot. The fort or position which contains the projector is not illuminated by the light itself. So the working of search-lights does not help the enemy. It was, indeed, made abundantly clear, during the search-light experiments which were conducted in the summer of 1904, whilst torpedo-boat attacks were made upon the large naval ports at night, that the highest speed was unavailing to enable those vessels to evade their exposure to the continuous beams of the fighting lights, and to avert their inevitable destruction by the countless groups of 12-pounders and Hotchkiss guns which bristle around the openings to all of these ports.

Let us turn now to the development of naval war material. Upon looking at the "Lists of Service Ordnance" which are supplied both to naval and military departments, we observe, with a sense of surprise, that it has not been found necessary to print a fresh set since June, 1900! Not that,

in any sense, it is deemed that finality has been reached by the Royal gun factories. But the fact is that the lists of June, 1900, were compiled somewhat in the future tense. The Mark IX 12-inch, steel-wired 50-ton gun, 496.5-inch in total length, of 40 calibers, which was foreshadowed only in those lists, is now an accomplished fact upon vessels of the King Edward VII type; and, as each of these huge battleships approaches completion, the four 12-inch wired guns are to be found lying upon skids in the naval ordnance yards, waiting for the ships—not ships for the guns, as was the case in 1887. When it is considered that each of these weapons takes three years to build, it is clear that the naval artillery authorities have not been backward in their warlike preparations for the past year or two. For let us bear in mind that, whatever may be the ordnance tables published by manufacturers, and the flights of fancy for the future from across the Atlantic, the King Edward VII type is far away the most powerful type of battleship actually afloat; and the Mark IX 12-inch and Mark X 9.2-inch wire guns upon that type, are the most powerful ordnance hitherto mounted as service weapons. It is the practice of other naval powers to talk of experimental weapons as though they were illustrative of service armament. We do not. The 12-inch gun has a muzzle velocity of 2750 foot-seconds, developing an energy of 44,662 foot-tons, with a penetrative force of 15½ inches into Krupp cemented steel at a distance of 3000 yards. This is with an uncapped projectile. With a capped projectile of armor-piercing character, having a small internal capacity of about 2½ per cent of the entire weight, the penetration would be 18 inches into Krupp cemented steel plates at 3000 yards. As it is doubtful whether battleships will be again loaded with armor plates of this prodigious thickness, it seems unnecessary, for the present at least, to aim at increased penetrative power. The same argument holds good with the 9.2-inch and 6-inch guns. The gun, with its improved muzzle velocity and penetration has beaten the armor plate, provided that the velocity is well over 1800 foot-seconds, the degree required to develop the usefulness of the soft metal cap; so we may stand easy for a time. Expert writers in some of last year's annuals have severely criticized our last-mounted 12-inch guns, because they are only of 40 calibers, and assumed to be inferior in range to other visionary weapons intended for foreign powers. It is remarkable how quickly experience gained is lost sight of. It is only from ten to fifteen years ago that both France and Great Britain built a number of heavy guns which were so unduly elongated that they drooped during practice with battering charges. Yet we are urged to repeat this unhappy and expensive experiment.

The discussion of the gun naturally leads us to that of the armor which it is designed to attack. We are indebted to Messrs. John Brown & Co., Limited, of the Atlas Works, Sheffield, for much valuable information on this head, showing recent progress in the improvement of armor plates. Krupp cemented plates are still the most advanced form of thick armor plate protection, although it is unusual to apply cementation to plates of 4 inches and under in thickness. We say this last with a certain amount of reservation, for as we shall presently see, the Hadfield Company appears to have made this year a specially hardened 6-inch plate which breaks up 6-inch armor-piercing shells, and it could probably repeat the process of manufacture with a 4-inch plate. The steel for Krupp cemented plates—and indeed for all the special plates which are now being made—has a high tensile strength, approaching 50 tons per square inch, and contains small proportions of nickel, chromium, and manganese. Cementation, or carburizing, is carried out in the same manner as was the practice observed in the Harvey process; that is to say, animal charcoal is placed between the faces of two plates laid together, face to face, which are run into a furnace with a bogie bottom, and bricked up for two or three weeks, seven days being allowed for cooling. In this way the proportion of carbon in the face is increased, and the front is then capable of being hardened.

Seven days are allowed for cooling, which has to be a most gradual process, in order to prevent the plates flying to pieces by cooling too quickly. In the final face-hardening the plate is subjected to heat graduated from the face to the back. After this heating the face is placed under a cold-water douche, from a series of pipes pierced with holes and containing water at a high pressure, which sprays with such violence as to prevent the formation of bubbles of steam on the surface. Messrs. John Brown & Co. afford, as a recent instance of the strength of these Krupp cemented armor plates, an experiment made with one of 5.9-inch in thickness, supported by an oak backing and 1¼-inch skin plate. Four uncapped shots were fired with a 6-inch gun at energies of 2664 foot-tons, which would represent an average range for attack. In no case was penetration effected or even of an important character. The equivalent resistance of Krupp cemented steel to that of wrought-iron is from 2.3 to 2.8. The armor plates now being placed upon the Britannia and the New Zealand are not trimmed and planed so extensively as was the case formerly by Admiralty instructions. Those near the water-line are made smooth so as not to create unnecesary friction, but the barbettes and turrets are left untouched upon the surface—a much less costly and more advisable plan. The less the skin surface is touched the better.

We must now turn to the question of projectiles. We have received from Messrs. Hadfield's Steel Foundry Company, Limited, much valuable and recent information on this head. That company has had very important experience during the past year with its cast-steel projectiles, none of which have undergone the forging process observed by other manufacturers. Hadfield's capped "Heclon" projectiles have given the following results, which are summarized from a long report: A 4.7-inch capped shell, with a striking velocity of 2100 foot-seconds, perforated a 6-inch K. C. plate; a 6-inch capped shell, with striking velocity of 2000 foot-seconds, perforated the same; a 7.5-inch shell, with velocity of 1980 foot-seconds, perforated a 7-inch plate; a 9.2-inch shell, with velocity of 2033 foot-seconds, perforated 9-inch plate. These figures speak for themselves. All the shells had a bursting capacity of about 2½ per cent. They perforated the plates and oak backing, and were afterwards found in condition for bursting, several practically undeformed. The result of these experiments demonstrates, "without a peradventure," as they say in America, the value of cast-steel of suitable quality for projectile manufacture, and the influence of the soft nose or cap.

The Hadfield Company has also made important strides in the improvement of 6-inch armor plates, these being also of cast-steel of special character, and called "Era." A shield of this material 6 inches in thickness resisted a 4.7-inch armor-piercing shell fired at 2100 foot-seconds velocity, and a lyddite 6-inch shell fired at 2035 foot-seconds velocity, the striking energy being 2875 foot-tons. This measure of resistance was, we should say, quite unique.

Some naval officers in this country are disinclined to view favorably the capped projectile, as its usefulness is not maintained below 1800 foot-seconds of velocity, and at sharp angles of inclination it does not act well. But we should say that its usefulness under normal circumstances far outweighs any defects that low velocities and oblique firing might create. The Hadfield Company has just executed a very extensive order for Spain for capped "Heclon" projectiles of large caliber—28, 24, and 14-centimeter—this being probably the first order for large-caliber capped projectiles made commercially in this country. The execution has given entire satisfaction.

The Hotchkiss Ordnance Company, Limited, has made considerable progress during 1904 in the development of its own special types of ordnance. The latest Hotchkiss 6-pounder, 57-milimeter, 58-caliber high-power semi-automatic gun, of which we shall later on give a full description, is a very remarkable weapon, and of greatly increased powers of

range and accuracy. It appears to contain the fewest number of separate parts that could be made sufficient for the mechanism of a semi-automatic gun, and yet all these can be separated by hand. Its simplicity and lightness, yet extraordinary length, make it one of the most effective quick-firers that we have seen. It possesses the following advantages: Greatly increased rapidity of fire. No danger of hang-fire, the automatic opening of the breech not taking place until the gun has been fired. One man less in the gun-crew.—*Engineer.*

THE DISPROOF OF THE EXISTENCE OF REED OR REDFIELD ROCKS (by G. W. Littlehales.—For fifty years mariners continued to believe, or to be unable to disbelieve, in the existence of dangerous rocks in the Pacific Ocean, in a position about seven hundred miles westward of San Francisco. In 1850 Captain Reed, of the brig Emma, reported that he had seen two rocks, measuring from six hundred to nine hundred feet long, and from two hundred and fifty to four hundred feet broad, and having a depth of about three fathoms of water over them, in latitude 37° 24′ north and longitude 137° 22′ west of Greenwich; and in 1851 a report came from the U. S. sloop-of-war Falmouth confirming the existence of rocks in this geographical position. Captain Redfield, of the whaler Susan Abigail, also reported in 1856 that he had discovered some rocks, with about ten feet of water over them, in a geographical position eleven miles to the northward of the geographical position stated by Captain Reed; and in 1866 rocks were again said to have been seen by Captain Cave, whose report assigned to them a position one mile to the northward and five miles to the eastward of the geographical position agreed upon by the original authorities. Commander Franklin, of the U. S. S. Mohican, reported in 1870 that the office of the harbor-master at Honolulu contained records showing that the ships Kuttosoff and Eliza Kimball had found these rocks, which by that time had come to be known as Reed or Redfield Rocks, and that the latter ship had anchored in five fathoms of water there, and described three of the rocks as extending considerably above the surface of the water.

In the meantime the bark What Cheer had, in 1858, passed over the locality in which the rocks were reported to exist, and her master stated that he could discover no evidence of their existence, and in 1863 the master of the bark Live Yankee had made a similar report; and, although it was well understood, on account of the uncertainty in the reckoning of these vessels and the margin of error inherent in the positions assigned to the rocks, how slight a foundation these reports afforded in disproof of the existence of what had been seen by six apparently reliable and careful ship-masters, and by five of them examined and described, yet they served to stimulate investigation. So that in the years immediately afterwards we find that searches were made by the U. S. sloop-of-war Kearsarge in 1870, the U. S. Coast Survey schooner Marcy in 1871, the U. S. Coast Survey steamer Hassler in 1873, the U. S. S. Narragansett in 1875. All of them, however, employed the inconclusive method of proceeding to the reported locality of the rocks and cruising back and forth over the region, with lookouts posted aloft and a certain amount of deep-sea sounding-line hanging over the side of the ship. The four vessels just named must have spent altogether 31 days in this way, and the total distance which they cruised back and forth over the locality is about 2800 miles.

The reconnaissance made by the Kearsarge took place on a beautifully clear day in September. The ship had proceeded from Honolulu, where the chronometers had been verified, and had every facility for determining the accuracy of her position in the field of search; but, although the range of view extended to a radius of ten miles around the ship as she steamed back and forth, visiting in turn each of the positions in which the rocks had been reported, the observed conditions did not reveal the slightest indications of the proximity of shoals or rocks, either by the breaking of waves or by the presence of birds or fishes.

The examination made by the Narragansett took place on a day in June which was most favorable for the work, as the atmosphere was remarkably clear, and there was a heavy swell that would have caused the sea to break in a depth of five or six fathoms; but the lookouts that were posted aloft and on the deck of the vessel during the day's search could discover no indications of the reported danger.

In the search by the Marcy the surface conditions were examined in great detail from July 23 to August 5, under favorable circumstances of wind and weather, and with a swell large enough at all times to cause the sea to break in a depth of three fathoms. During this search the distance run by the vessel was one thousand and fifty miles, of which seven hundred and seventy miles were made in daylight, when breakers or any discolored water should have been visible within at least one mile. A constant lookout was maintained from the masthead, but no breakers were seen, nor any indications of shoal-water, such as the presence of gulls, seals, fish, or kelp. The water was uniformly of a deep blue, and at various places the deep-sea sounding-line was lowered to depths varying from three hundred to eighteen hundred fathoms without touching bottom.

The site of the reported dangers was again and still further examined between the 24th of May and the middle of June, 1873, by the U. S. Coast Survey steamer Hassler, but without finding any feature corresponding to Reed or Redfield Rocks. The steamer ran fourteen hundred miles in traversing the region in the vicinity of the reported geographical positions. Lookouts were constantly aloft, but no indications of shoal-water could be discovered.

It is plain that the force of the evidence in disproof of the existence of the Rocks, proceeding from these four searches, rested almost altogether upon the result that the observers did not see them; and it was not until the year 1881 that the first positive evidence was contributed toward the settlement of the question. In August of that year the U. S. S. Ranger sounded down to the bottom with pianoforte wire at thirty stations, whose geographical positions were accurately established within the area bounded by the parallels of 37° 20′ and 37° 40′ of north latitude and the meridians of 137° 20′ and 137° 40′ of west longitude. In the light of a mathematical investigation undertaken at the Hydrographic Office to determine the forms and dimensions of isolated submarine formations in the open ocean, these soundings afford positive proof of the absence of Reed or Redfield Rocks from the area which was sounded out.

Isolated formations occupying comparatively limited areas at the bottom can and do occur in deep waters. The minimum radius at the bottom which a dangerous shoal can have must vary directly with the depth of the surrounding sea, but, on the average, in a sea of 2500 fathoms in depth, it may be stated as ten nautical miles. An interval of ten miles coupled with an interval of two miles and employed systematically in sounding would be sufficient to prove the existence or absence of any formation rising close to the surface. Of all the possible ways in which a ten-mile interval could lie with reference to a submerged peak, that which would be most advantageous for a prompt discovery of its existence is the condition in which one end of the interval is at the bottom of the slope and the other near the apex, and that which would be least advantageous is the condition in which the interval is bisected by the position of the apex. In the latter case there would be nearly equal soundings at both ends, but the soundings at the ends of the adjacent two-mile intervals would immediately disclose the slopes.

Although the exhaustive examination made by the late Admiral Philip in the U. S. S. Ranger was conceded to have disproved the existence of Reed or Redfield Rocks within the area that was searched by him, a doubt remained, owing to the imperfect determination of the geographical position assigned, as to whether the rocks might not be within reasonable limits outside of the field of his inspection, notwithstanding the curious accord-

ance among the reported positions, which only range seven minutes of arc in longitude and seventeen minutes in latitude; and this doubt was strengthened from time to time by the accounts of incoming mariners, who asserted that they had seen these dangers. In 1888 the master of the ship British Yeoman reported that he had seen these rocks in passing them; and in 1889 the master of the schooner Una reported that he had observed a peaked rock standing four feet above the surface of the sea in latitude 37° 24′ north and longitude 137° 26′ west, saying, "There is not any room for doubt as to this being a rock, but the position may vary a little on account of the sights not being extra good."

The whole question was finally set at rest in the early part of the year 1901, when the U. S. S. Wheeling, under instructions prepared by the Hydrographic Office, searched the area marked out by assigning extreme errors of ± 60′ in longitude and ± 40′ in latitude to the average of the reported geographical positions, by sounding down to the bottom of the ocean at intervals so closely spaced that no formation composed of the materials which constitute the earth's crust and shaped with sufficient strength to resist crushing under its own weight and the weight of the superincumbent body of water could rise from a depth of 2600 to 3000 fathoms to the surface of the ocean in the interval between any two of the sounding stations.

The area in the immediate vicinity of the reported geographical positions of the danger, bounded by the parallels of 37° 20′ and 37° 40′ of north latitude and the meridians of 137° 20′ and 137° 40′ of west longitude, which was searched by the U. S. S. Ranger in 1881, was not entered by the Wheeling. The Ranger obtained twenty-nine soundings, ranging in depth from 2776 to 3097 fathoms, and the Wheeling fifty-nine soundings, ranging in depth from 2850 to 3352 fathoms. Numerous specimens collected by both vessels indicated that throughout the combined extent of the searches there is a sameness in the characteristics of the bottom soil.

The chart of the soundings that were taken demonstrates that there is no submarine mountain culminating near the surface of the sea in this region, and shows with equal force that there never were any rocks here nor any shoal upon which a vessel could have anchored.

This is not a locality in which the floating things of the ocean are apt to collect, and it will perhaps ever remain a mystery as to what misleading appearances of the surface of the sea could have given rise to the reports which caused the representation for fifty years in the charts of all the great maritime nations of a dangerous feature which had no real existence.—*Bulletin of the American Geographical Society.*

BOOK NOTICES.

"Military Government and Martial Law," by William E. Birkhimer, L. L. B., Major, General Staff, U. S. Army, 2d Ed. Rev., 1904, 653 pages. Franklin Hudson Publishing Company, Kansas City, Mo.

This work is a revised edition of the original work published in 1892, rendered necessary by the changed condition of affairs through the acquisition of our new territorial possessions, and by new phases of the relation of the civil to the military authorities as shown in the labor and other troubles of 1894, in Chicago; 1899, in Idaho; 1902, in Pennsylvania.

Of this volume Judge-Advocate General Davis, U. S. A., says, "The original work is the most complete treatise on the subject in the English language, and embodies the views which prevail in Anglo-Saxon countries on the subject of martial law and military occupation."

Further comment on its value is unnecessary.

The following extract from the chapter, entitled "Responsibility of Commanders," is worth quoting:

The author has referred to a decision of the Supreme Court (91 U. S. Reports, p. 172), and goes on to say: "This case arose from a naval officer, Wilkes, while on a distant foreign station, having inflicted corporal punishment on a sailor, Dinsman, who after their return to the United States instituted suit against the officer, resulting in a verdict for the plaintiff. This the Supreme Court reversed, holding that for all that appeared on the record, Captain Wilkes had but done his duty. The opinion is replete with important principles affecting executive officers called upon to exercise their judgment in positions of responsibility.

"It was observed in the opinion that Captain Wilkes' duties were imposed upon him as a public officer, and required him to exercise a discretion in their execution. The position of the officer in such cases becomes *quasi* judicial and is not ministerial. It is well settled that all judicial officers, when acting on subjects within their jurisdiction, are exempt from civil prosecution for their acts. It was especially proper not only that an officer situated like Captain Wilkes be invested with a wide discretion, but upheld in it when honestly exercising it and not transcending it. When so situated an officer's reasons for acting one way or another are often the fruits of his own observation, and not susceptible of technical proof on his part. No review of his decisions, if within his jurisdiction, is conferred by law on either courts or juries or subordinates." P. 544.

"Syllabus of Davis' International Law," by C. A. Seoane, Third U. S. Cavalry, published by Hudson-Kimberly Publishing Company, 1904.

The object of this book is briefly stated in the preface as follows:

"This compendium is written primarily for the use of students at the service and garrison schools. Like the use of syllabi at various colleges, it is intended to be used in connection with the original subject as a means of making quick reviews and final cramming for examinations."

In describing the arrangement of the book, the author writes, "The chapters, headings, and titles to articles are maintained in capitals as in the original, they have also the same sequence, and after each follows in parentheses the number of the page they occupy in the original, thus facilitating a ready reference between the two. Interspersed throughout the work there will be found numerous blank leaves."

He adds a few words of advice for the preparation of the daily lesson. "If the student in preparing his daily recitation reads the original work first and takes the syllabus for the second reading, using the blank leaves for such additional matter as he thinks proper and for notes taken at lectures, and for such points as are expounded in the section room; he will then have prepared a system which will render a quick and intelligent review possible and reduce the drudgery of preparing for an examination to the lowest minimum which it is possible to devise, but it should be added that poor results only need be expected if the original is entirely ignored."

The volume upon which this syllabus is based, "Elements of International Law," by Lt.-Col. George B. Davis, U. S. A., at present Judge-Advocate General of the Army, is, in the opinion of the writer, one of the best manuals for the student. It has not the voluminousness of Woolsey and Hall; but the author has, in his treatment of the subject, the great merit of brevity and clearness. It has been adopted generally as a text-book in the army. This syllabus as an aid to the study of international law should prove of value.

"Our Navy and the Barbary Corsairs." An account of the relations of the United States with the Barbary powers a century or more ago is told by Dr. Gardner W. Allen in a romantic and remarkably interesting form. The volume has just appeared under the title of "Our Navy and the Barbary Corsairs" from the press of Houghton, Mifflin & Co., and while the book is classified under "History" the picturesque exploits of Preble and Decatur and the adventures of our American seamen and consuls with the famous pirates of the Mediterranean give the entire work a flavor of true romance. It is hard to realize the extent to which the Mohammedan states on the north coast of Africa levied tribute on the European nations until their piracy was checked by the United States. In the first years of our national existence our Government followed the example of European powers and tried to protect our shipping by making money payments; but when Tripoli demanded larger sums, our refusal led to war. Dr. Allen's book tells fully the circumstances of this episode and of the admirable record which our little navy made in the Mediterranean during the first years of the 19th century.

The recent experiences of several of our citizens in Morocco have

brought freshly before us the sort of people who enslaved and terrorized our early seamen. The bandit chief, Raissuli, is doubtless a descendant of the Barbary Corsairs. It was in fighting the pirates of the Mediterranean that many of our early naval commanders obtained the training which enabled them, a few years later, to win glory in their unequal contest with the overwhelming navy of England. So little has been previously written upon this subject that Dr. Allen has found it necessary to explore the original records for many of the details. The various events scattered over a period of about forty years are brought together in his interesting history. Publishers, Houghton, Mifflin & Co. Price $1.50 net.

"A Military and Naval Dictionary," compiled by Major J. P. Wisser, U. S. Army, and H. C. Gauss, Esq., of the Navy Department.

A good Military and Naval Dictionary in the English language, up to date in all respects, is a great desideratum. To partially supply the want of such a work of reference the present work has been prepared.

There is at present no dictionary of *modern* military or naval terms in the English language. Wilhelm's is the latest, and that is practically obsolete in most respects.

Military literature has not only increased enormously in volume in the last quarter of a century, but has completely changed its vocabulary. The nomenclature of military material is entirely different, and even the forms of drill regulations, tactics and strategy have undergone transformations which require new expressions to define them.

In the present work *technical* forms of defining words have been avoided as much as possible, in order that the general student or reader may be able to comprehend them more easily.

To the military or naval officer the work will be found useful as a work of reference, in spite of the fact that much of the material is naturally familiar.

To the officers of the National Guard (or organized militia of the United States) and to the Naval Reserve, it will be found most useful, not only in supplying them with a new vocabulary of modern terms, but also in furnishing correct ideas of modern tactics.

To the general reader who desires to read understandingly any article relating to modern military matters, this little volume will be found quite essential. Any one who reads the reports of the war in the Far East will be greatly assisted by this handbook, and the accounts of the army maneuvers, of improvements in war material, of our own operations in the Philippines, or, indeed, of any military matters, will all assume a clearer aspect by its assistance.

Besides the ordinary service text-books, manuals, and tactics, both army and navy, the following works were consulted in its preparation:

Wörterbuch der Marine. Julius Heinz. Pola. 1900.
French-English Military Dictionary. Willcox. 1899.
Petit Dictionnaire Militaire. Stavenhagen. 1898.
Militaer-Lexikon. Frobenius. 1901.

The military and naval articles in the *New International Encyclopædia*

were also referred to, as they were written by military and naval authorities of the first order.

The work is condensed into a small handbook, constituting a handy volume of ready reference, and the words selected are clearly defined in ordinary language. In arranging and selecting the list of words to be defined the most recent military and naval dictionaries in foreign languages were used as types. The work should therefore commend itself to the navy, the army, the National Guard, the Naval Reserve, and the general reader, or the citizen who is interested in military matters. No other work covering the same ground is available, in our language, and its subject-matter includes the latest words introduced into our military or naval vocabulary. L. R. Hamersly Company, 49 Wall St., New York. Price 50 cents, postage free.

"Estimating Distance Tables," by Capt. Edwin Bell, 8th U. S. Infantry. Illustrated. Cloth, 75c. Franklin-Hudson Publishing Company, Kansas City, Mo.

The purpose of these tables is to relieve the company commander by eliminating the mass of tedious calculation, and, by permitting the instant verification of an estimate, to expedite the progress of the exercise, and enable him to give his company much more practice.

"Handling the Straight Army Ration and Baking Bread." Presented by Capt. L. R. Holbrook, 5th U. S. Cavalry. Assisted by Color Sergeant Patrick Dunne, 5th U. S. Cavalry, Regimental Instructor of Cooks. Illustrated Cloth, $1.50. Franklin-Hudson Publishing Company, Kansas City, Mo.

Col. Chas. A. P. Hatfield, 13th U. S. Cavalry, says: "I can easily imagine that this manual will be a practical and valuable work."

Capt. J. McI. Carter, 14th U. S. Cavalry, says of Sergeant Dunne: "I have closely observed his method of handling the ration and instructing cooks and regarded his method and the results obtained as superior to any I have seen in their service."

A practical manual for army cooks, mess stewards, and post bakers in field or in garrison and on the march, and for all company officers, and post treasurers, and mess officers of troops aboard army transports.

"Catechismal Edition of the Infantry Drill Regulations, 1904, United States Army," by Brig.-Gen. William F. Spurgin, U. S. Army (retired). Definitions; General Principles; School of the Soldier; School of the Squad; School of the Company; School of the Battalion; Evolution of the Regiment; The Brigade; The Division; The Corps; Ceremonies; Reviews; Parades; Inspection; Muster; Escorts; Guard Mounting; Manual of the Saber; The Color; The Band; The Advance and Rear Guard; Outpost; Marches; Camping; Honors; Trumpet Calls, etc. Price, Cloth, 50c.; Tag Board, 40c. Franklin-Hudson Publishing Company, Kansas City, Mo.

The object of this book is to bring out prominently, by means of questions

and answers, every statement made in the Infantry Drill Regulations, and in so doing strictly follows the text.

"Soldier's Handbook of Target Practice." Cloth, 50c.; Paper, 40c. Franklin-Hudson Publishing Company, Kansas City, Mo.

This book is an abridgment of the "Firing Regulations for Small Arms, 1904," to which is added score sheets for the use of the individual soldier in recording his firing on the range. The instruction of an intelligent soldier can be much hastened, if in addition to oral teachings, he is given an opportunity to read the drill book. It should be in the hands of every soldier of the regulars or militia.

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE U. S. NAVAL INSTITUTE.

TO THE OFFICERS AND MEMBERS OF THE INSTITUTE:

Gentlemen:—I have the honor to submit the following report for the year ending December 31, 1904.

ITEMIZED CASH ACCOUNT.

RECEIPTS DURING THE YEAR 1904.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Totals.
Dues	$ 386 35	$ 531 76	$ 785 65	$ 539 70	$ 2243 46
Subscriptions	298 48	179 12	249 09	205 90	932 59
Extra publications	2265 08	5714 49	3628 82	5913 50	17521 89
Sale of proceedings	18 10	359 48	5 11	19 00	401 69
Advertisements	223 00	371 00	259 60	221 25	1074 85
Binding	1 00	8 80	8 00	2 00	19 80
Interest	85 22	....	306 81	40 00	432 03
Premium on money orders	10	....	....	....	10
Insurance	804 74	....	....	....	804 74
Life membership fees	....	90 00	30 00	60 00	180 00
Postage	....	86	18	4 26	5 30
South. R. R. 5% Con. B'ds	....	1131 27	....	....	1131 27
Wash. Elec. R. R. 4% B'ds	....	....	....	1715 00	1715 00
Credits	....	....	4 99	40	5 39
Cash for Check	....	....	80 00	....	80 00
Totals	$4082 07	$8336 78	$5358 25	$8721 01	$26548 11

EXPENDITURES DURING THE YEAR 1904.

Items.	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.	Total.
Printing and binding proceedings	$ 611 26	$ 717 04	$ 790 19	$ 655 09	$ 2773 58
Printing and binding extra publications	1101 49	2576 64	2716 33	2891 61	9286 07
Authors of Text books	300 00	350 00	405 15	732 00	1787 15
Authors of articles published in proceedings	215 00	30 30	75 00	60 00	380 30
Salaries	465 00	465 00	465 00	525 00	1920 00
Postage	57 54	85 27	73 77	90 98	307 56
Expressage	24 78	29 90	7 28	49 64	111 60
Freight and hauling	5 71	9 03	13 05	6 52	34 31
Commission to advertising agent	50 00	100 00	....	75 00	225 00
Telegrams and miscellan.	10 65	21 26	8 59	23 68	64 18
Purchase of S. R. R. 5% bonds	1131 25	....	....	....	1131 25
Purchase of Washington Elec. R. R. 4% bonds	....	....	....	1715 00	1715 00
Prize essay award	200 00	....	....	....	200 00
Prize essay medal	15 00	....	....	....	15 00
Honorable mention essay	75 00	....	....	....	75 00
Purchase of back numbers proceedings	3 15	3 62	....	16 75	23 52
Stationery	37 03	27 95	14 67	93 32	162 97
Engraving P. E. medal	....	7 00	....	....	7 00
Advertising Petty Officers Drill Book	....	22 45	....	....	22 45
Insurance	....	....	70 20	31 00	101 20
Furniture for office	....	....	6 60	28 00	34 60
Check for cash	....	....	80 00	....	80 00
Remodeling typewriter	....	....	47 50	....	47 50
Rebate	....	....	4 49	....	4 49
Check returned for endorsement	....	....	9 00	....	9 00
Totals	$4292 86	$4445 46	$4786 82	$6993 59	$20518 73

SUMMARY.

Balance of cash unexpended Jan. 1, 1904, including $150.00 held to the credit of the reserve fund	$ 8013 53
Total receipts for 1904	26548 11
Total available cash, 1904	$ 34561 64
Total expenditures, 1904	20518 73
Cash unexpended January 1, 1905	$ 14042 91
Held to the credit of reserve fund	330 00
True balance January 1, 1905	$ 13712 91
Bills receivable for back dues	1638 27
" " " binding	14 60
" " " subscriptions	20 89
" " " sales	1094 47
" " " advertisements	598 00
Value of back numbers of the proceedings (estimated)	275 00
" " Institute property, furniture	300 00
" " extra publications, including electrotype plates	4670 00
Total assets, exlusive of reserve fund	$ 22324 14

RESERVE FUND.

District of Columbia 3.65% registered bonds	$ 3000 00
" " " coupon bonds	650 00
Deposited in Seamen's Bank, New York, N. Y.	1433 14
" " Farmers' National Bank, not invested	330 00
Total	$ 4413 14

Very respectfully,

PHILIP R. ALGER, *Professor U. S. Navy,*
Secretary and Treasurer.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut-Com. A. D. Brown, U.S.N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U.S.N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U.S.N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap. U.S.N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U.S.N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U.S.N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U.S.N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U.S.N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U.S.N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U.S.N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U.S.N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U.S.N.

"CUILIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U.S.N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U.S.N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U.S.N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U.S.N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORT FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U.S.N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887 By Lieutenant C. T. Hutchins, U.S.N.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U.S.N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U.S.N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U.S.N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U.S.N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U.S.N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U.S.N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U.S.N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U.S.N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U.S.N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U.S.N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U.S.N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U.S.N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U.S.N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U.S.N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U.S.N.I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U.S.N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U.S.N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U.S.N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U.S.N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U.S.N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U.S.N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U.S.N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U.S.N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U.S.N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U.S.N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U.S.N.

1904.

The Fleet and its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL, AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-second year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer, or to the Corresponding Secretary of a Branch. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from officers of the Army Revenue Marine, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing.

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed to Secretary and Treasurer, U. S. Naval Institute, Annapolis, Md., and all checks, drafts and money orders should be made payable to his order, without using the name of that officer.

OFFICERS OF THE INSTITUTE.

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Professor PHILIP R. ALGER, U. S. Navy. (ex-officio.)

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1906.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1905. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention, may be published also, at the discretion of the Board of Control, but only with the consent of the author.

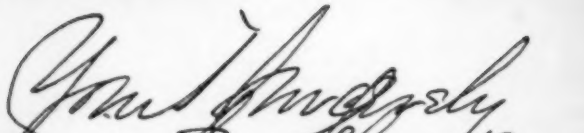
7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the Prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.



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